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Institute of Archaeology, University of London, *Bulletin* 15, 1978.

Anthony King, A Comparative Survey of Bone Assemblages from Roman Sites in Britain.

The totals at the foot of Table 2, p.211, should be replaced by the following:

1,863	7,759	24.0%	1,860	3,554	52.3%	1,874	2,273	82.4%

Howard Hawkes, Three Small Ivories from Nimrud in the Institute of Archaeology, London.

p.173, line 26 for Plate II, A, read Plate I, A.

24 JAN 1979

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To

DR TADEUSZ JOSEPH SULIMIRSKI

dedicated by his colleagues at the

Institute as a mark of their respect

and affection

Dr T. J. Sulimirski

Dr Tadeusz Joseph Sulimirski, whose photograph forms the frontispiece of this volume of the *Bulletin*, celebrated his eightieth birthday in the course of the year. Because of his long and close association with the London Institute of Archaeology since the end of the war, and of the great respect and affection in which he is held here, we are taking this opportunity of publicly expressing our congratulations to him on attaining this age while still continuing his active career as an archaeological researcher and writer.

Born in the town of Kobylany in 1898, when it was still part of the Austro-Hungarian Empire, he began to study archaeology only in his later twenties after a varied experience, which included several years service in the Polish Army during and after the First World War, and a subsequent business career, in the course of which he studied law at the University of Lwow, acquiring a doctorate in that subject in 1924.

In the following year, while continuing with his career, he enrolled again at Lwow University as a student of archaeology and anthropology, in which he obtained a Ph D in 1929. Then, after some months spent as a postgraduate student of archaeology in the Universities of Berlin and Halle, he was appointed Deputy Professor of Archaeology at his old university of Lwow in 1930, a post which he held for six years, until, in 1936, he obtained the Chair of Prehistoric Archaeology at Cracow.

In 1939, with Hitler's invasion of Poland imminent, he rejoined the Polish Army, with which he eventually reached France, via Rumania, and ultimately, after the fall of France in 1940, arrived in Britain. In 1941 he was seconded from the Army to take up the post of Secretary-General to the Polish Ministry of Education in London, in which capacity he served until the end of the war in 1945.

After the war he remained in Britain, at first holding various posts connected with the education of the Polish community in this country, but gradually turning back more and more to archaeological teaching and research as opportunity offered. His first lecture course on East European archaeology at the Institute was given at the invitation of V. Gordon Childe in the 1952–3 session, but it was not until 1958 that it became possible to create a part-time post here for him in this subject, which he then held until he reached retirement age in 1965, after which, however, he still continued to teach for us in an honorary capacity.

His many other activities during the post-war years have included lecture courses at the School of Slavonic and East European Studies and the Institute of Classical Studies in London, and for Departments of Archaeology at other British universities. During the

greater part of this period he has also travelled widely and lectured to universities and other learned bodies in many countries. His most important contribution to learning has, however, undoubtedly been the steady flow of books, articles and research papers which he has published year by year, the enormous range of which can be judged from the list appended to this note. Besides contributions to research, such as *Corded Ware and Globular Amphorae North-East of the Carpathians* (1968), which includes reports on many of his pre-war excavations in Poland, his output embraces works of synthesis, such as his book *Prehistoric Russia* (1970) and reviews of recent literature, such as the articles he has contributed regularly to this *Bulletin* since 1960, which have done much to make the work of Russian and East European archaeologists better known to English readers. His studies of the archaeology of the Sarmatians and Scythians has also led to a number of publications. The article on the Ziwiye Find, which appears in the present volume, is the latest offshoot of this long-standing interest.

Dr Sulimiriski was elected an Honorary Fellow of the Royal Anthropological Institute in 1940 and of the Society of Antiquaries of London in 1945. In 1973 the Alfred Jurzykowski Foundation of New York recognised his services to archaeology, and in particular to the study of Indo-European and Slavonic prehistory, by making him an award.

In Tadeusz Sulimirski we salute a splendid example of the dedicated and disinterested scholar, whose single minded devotion to his subject has triumphed over all the disruptions and difficulties which the war and its aftermath entailed for him. Though cut off, since 1939, from the possibility of doing original work in the field, he has contrived to make a distinguished contribution in many other ways, and is as well-known and respected in Eastern Europe as in the West. It has been a privilege to have him as a colleague, and we are proud that the Institute is so closely associated with his achievement.

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The Background of the Ziwiye Find and its Significance in the Development of Scythian Art

by T. SULIMIRSKI

In his tale of the Scythians, Herodotus (*Histories*, IV: 5–12) quotes three different accounts relating to the origin of this people, gathered during his stay in Olbia in mid-5th century BC. Each of these accounts evidently contains a core of truth, but each relates to a different period of the history of the inhabitants of the country later called 'Scythia'; and each deals with a different people, all of whom were at some later period integrated into a larger 'Scythian' complex under the leadership of the Royal Scythians. The three accounts go back to the roots of Scythian tribal division, and echo the different origin of the tribes, the recollection of which still lingered in their memory.

The scene of Scythian history, as recorded by Herodotus, is laid in ancient Scythia, the modern Ukraine. But according to his third legend, it started in the steppe east of the lower Volga, on the Eurasiatic border. The Scythians who originally lived there, 'being harassed by the Massagetae' crossed the Volga and entered the Ukrainian steppe country, then in the possession of the Cimmerians who, being forced to abandon their country, 'fled from the Scythians into Asia'. The Scythians, in pursuing them, crossed the Caucasian Mountains, but they missed them and subsequently entered the Median territory (Herodotus, I: 106, 107), where they defeated the Medes. Thus, the latter 'lost their dominion, and the Scythians became masters of all Asia' and then governed it for 28 years.

Herodotus' story of the Scythian wanderings and their subsequent stay in 'Asia', which in fact seems to mean in north-west Iran, evidently refers to the initial stage of the history of the most important Scythian tribe, the Scoloti, whose name has been distorted by the Thracians and in its corrupted form, the Skythai, was transmitted to the Greeks.

The Scythian drive into north-western Iran, their defeat of the Medes and their subsequent 'rule over Asia' (Herodotus, I: 104) look like a series of events following each other at short intervals. In fact, however, their accomplishment required a longer time. By the end of the 8th century BC, the northern 'tribal peoples' reached the northern confines of Urartu and of Iran. First mentioned (between 722 and 714 BC) were the Cimmerians in the north-western region of Urartu. As to the Scythians, the study of the

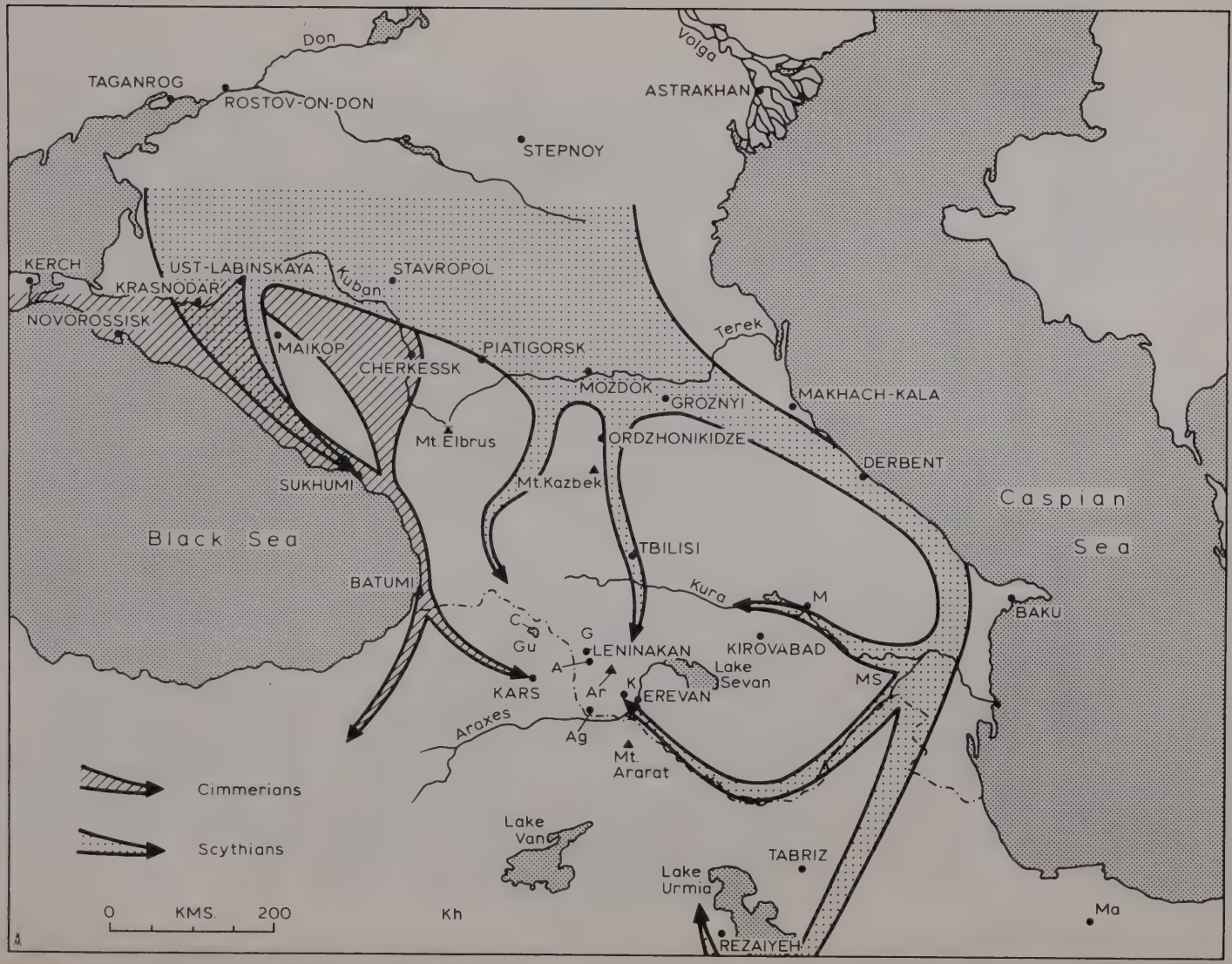

Fig. 1 Expansion of Scythians and Cimmerians across the Caucasus in the 8th to 7th centuries BC (based on Krupnov 1960).

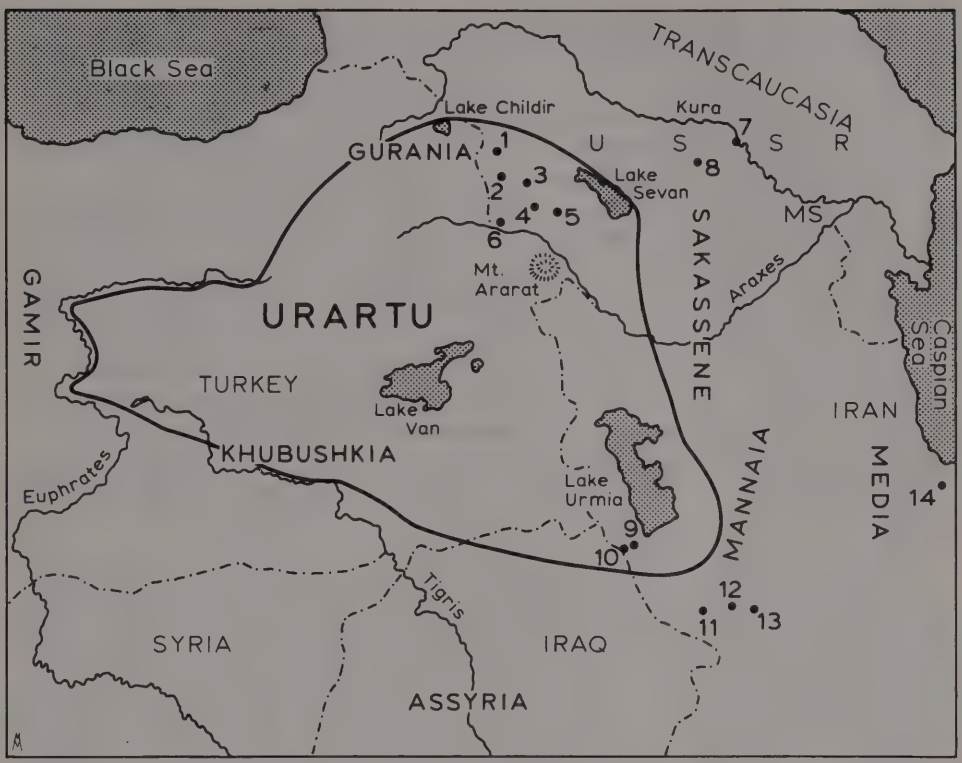

Fig. 2. The Kingdom of Urartu and its neighbours.

Key

1, Leninakan
2, Artik
3, Mt Aragats
4, Karmir-Blur
5, Erebuni
6, Argishtikhinili
7, Mingechaur
8, Kirovabad
9, Hasanlu
10, Sé Girdan
11, Sakkez
12, Ziwiye
13, Kaplantu
14, Marlik
MS, Milskaya Steppe

Key to Fig. 1

C, Lake Childir
G, Ganlidzha
M, Mingechaur
Gu, Gurania
A, Artik
Ar, Mt Aragats and 'Catacomb' Cemetery
K, Karmir-Blur
Ag, Argishtikhinili
Kh, Khubushkia
MS, Milskaya Steppe
Ma, Marlik

onomastic and toponomic material from north-west Iran, gathered from Assyrian records (Grantovskii, 1970: 10), implies that they had not reached the region of Lake Urmia by the end of the 8th century BC. For the first time, they were mentioned in Assyrian annals at the time of Esarhaddon (681–669 BC).

Archaeological traces of the southward drive of the Scythians, whom we shall call 'the Early Scythians', are often not easily recognisable. But in any study of ancient migrating tribes a gradual transformation of their culture must always be taken into account: as time elapses after leaving the country of their origin, they progressively lose features characteristic of their actual culture in proportion to the distance that separates them from their former homeland. In the new countries they are unable to acquire all the articles of their customary equipment, and have to procure them from what is available locally (Abramova, 1961: 10 ff). Thus, the culture of the migrating Early Scythians must have also undergone such a transformation. In losing progressively some features characteristic of their original culture, they gradually had to adopt elements of the culture of the natives among whom they temporarily settled. Nevertheless, their identification is still possible, thanks to a few characteristic elements of their original culture which they retained.

It would be wrong, however, to expect these Early Scythians to have been – as early as the 8th and 7th centuries BC – in possession of 'Scythian' culture and of the splendid 'Scythian' art. At that time, these rough nomads were bearers of the so-called Srubnaya-Khvalinsk culture of the Late Bronze Age, a hybrid culture formed around 1300–1200 BC in the steppe on the lower Volga, by the 'Andronovo' tribes who advanced from Kazakhstan, and mingled there with that section of the 'Srubnaya culture', natives of the Volga steppe, who did not abandon their country.

During the few centuries that followed the formation of the Srubnaya-Khvalinsk culture, the conditions in the steppe on the lower Volga were not much changed. Important changes occurred there again in about the 10th or 9th centuries BC. As previously, the Andronovo tribes of western Kazakhstan were forced to move westwards and, in entering the Volga steppe, they coerced several tribes of the Srubnaya-Khvalinsk culture, the Proto-Scythians, to retreat westwards and southwards (Komarova, 1962: 69; Kosarev, 1965: 242; Khalilov, 1971: 183). The latter then spread over the whole steppe country extending west of the Don up to the Dnieper and southwards over the Crimea and the Caucasian highland. Their predecessors in that area were the Early Iranians of the ancient Srubnaya culture, who were for the most part overpowered by the eastern newcomers, but some retreated westwards across the Dnieper, or southwards into the westward part of the Caucasus and the countries further to the south.

In the new countries, the Scythians, and first of all their princes and chiefs, began to adopt elements of the higher culture of their surrounding population. Above all, they availed themselves of the new, more effective weapons invented, or improved, by the highly skilled Transcaucasian craftsmen. At the time of their arrival in the Caucasian area, almost none of the articles commonly considered as characteristic of the Scythian culture, were known to the Early Scythians, even in their rudimentary form. Akinakes-

daggers, swords, battle-axes, three-edged socketed arrowheads were all Transcaucasian, mainly Georgian, inventions (Pogrebova, 1962: 22; Lordkipanidze, 1968: 25; Trapsh, 1954; Krupnov, 1960, Sulimirski, 1954: 295).

The same applies to Scythian art: on their arrival in Transcaucasia, almost the only artistic expression of the Early Scythians of the Srubnaya-Khvalinsk culture were multiform geometric patterns applied to the decoration of pottery and various articles, probably including fabrics and costumes; no traces of any animal motifs have been noticed. The decoration of the horse harness and weapons found in the grave of a Scythian chief of the time 650–600 BC under a mound in the Milskaya steppe in Soviet Azerbaijan consisted only of geometric designs (Iessen, 1965: 22; Terenozhkin, 1971: 71); the sole exception was the decoration of an Urartian imported bronze chamfron, which consisted of some small and some larger round bosses in *repoussé* technique, and of two small figures of animal (stags?) similarly executed (Fig. 4, 4).

The Srubnaya-Khvalinsk Early Scythians seem to have proceeded southwards along the western coast of the Caspian Sea, as attested by Andronovo elements hitherto unknown in that area, represented by bronze articles and pottery characteristic of that culture found along that way (Griaznov, 1966: 33). Their presence has been traced in Dagestan early in the first millennium BC. A marked difference between the remains of the Kaya-Kent culture there of the 11th to 9th centuries BC and those of the later stage of that culture, of the 9th to 7th centuries BC, was the outcome of the influx in the country of the Srubnaya-Khvalinsk Scythians, who introduced several new features into the local culture, in particular, horse riding and transport, horse harness hitherto unknown in that area, horse graves, etc., but several vessels, in their shape and decoration, resemble vessels of the Andronovo culture of Kazakhstan, and even those of the Karasuk culture of the Altai and Ienissey steppe (Griaznov, 1966: 31, Fig. 4). Close connections between the people of the Kaya-Kent culture of Dagestan and its contemporary peoples in central Transcaucasia during the 9th to 7th centuries BC, reflected in the archaeological material of that period, were presumably due to the advance in the latter area of the Srubnaya-Khvalinsk immigrants.

The 9th to 8th centuries BC were a much troubled period in Transcaucasia. Many 'cyclopean' fortresses were built then, mainly in the western part of the country and around the border of Urartu; some peoples were dislodged, new cultures appeared in some parts of the country. Important changes took place in the burial ritual and in the social structure of the indigenous population: from the 8th century BC onwards, richly furnished graves of chieftains, some with human offerings, contrast strongly with the burials of the ordinary people and imply a considerable social differentiation. Anthropological studies indicate that serfs were of a different racial type from that of their masters, on whose graves they were put to death. The Scythian newcomers in the country undoubtedly contributed considerably to these changes.

A consequence of the arrival of the Scythians in Transcaucasia was the formation in Azerbaijan and its adjacent areas of the 'White inlaid pottery culture' called also the 'Gandja-Karabagh', attributed by some scholars to the Scythians (Chernikov, 1960: 117).

It was formed in about the 9th to 8th centuries BC, and lasted till the 7th century BC. It embodied many ancient local features. In a number of eastern and also western Transcaucasian graves, a horse was buried beside its master, a genuine steppe custom. It is of interest to note that bronze buckles of a special type found in Archadzor in Azerbaijan represent a type common in the Sauromatian culture of the Volga steppes, and met also in several Sacian groups in Kazakhstan and Soviet Central Asia (Uygarak of the 6th century BC) (Smirnov, 1964: Fig. 23, 3, 17; Vishnevskaya, 1973). Finally, it has been emphasised (Chernikov, 1960) that a number of place names in Transcaucasia correspond with some toponyms of the Avesta, which postulates the presence of contingents from the Kazakhstan steppes among the nomads who invaded Transcaucasia in the 9th to 8th centuries BC. Another important fact is that the Scythians must have settled for a long period in both Iranian and Soviet Azerbaijan, well attested by the name of the country which has been known since under the name of the 'Land of the Skythenoi' (Xenophon) or 'Sakasene' (Ptolemy), and its people have been called 'Sacasseni' (Livy); the region of Kirovabad in Soviet Azerbaijan has been called 'Scyzhini' by local people.

'Scythian' type weapons have been found in many burials in western Transcaucasia, in particular in Georgia and Abkhasia, dated mainly to the 7th and 6th centuries BC. For the most part, they cannot be attributed to actual Scythians, being found in non-Scythian cemeteries and graves associated with articles typical of the indigenous Kolkhidic culture (named after Kolkhida, near Gari); furthermore, the date of the earliest articles of the 'Scythian' type, of the 8th century BC, implies that the relevant graves must have been of the natives of the country, and the 'Scythian' type articles were only subsequently adopted by the Scythians (Krupnov, 1960: 63; Koridze, 1965).

The results of the investigation of several sites in central Azerbaijan are important (Aslanova, Vaidov and Ione, 1959; Hummel, 1933; Khalilov, 1971; Kromer and Lippert, 1976; Kushnareva, 1957). A large 'flat' cemetery and a number of barrow graves, and also a settlement (called an 'earthwork') of the Scythian period were investigated at Mingechaur on the Kura. In the barrow graves weapons (akinakes-daggers, iron spearheads, 'Scythian' type arrowheads, etc.) and personal ornaments (e.g. bronze mirrors) (Fig. 3) were found, which suggest that some Scythian princelings and members of the Scythian aristocracy must have been buried in them. In five barrows a total of 30 horse skeletons was found, but there were no human sacrifices. Bronze bridoons were found on 17 horses only; they were mainly of the late 8th or 7th centuries BC (Terenozhkin, 1971–4: 71). The inhabitants of the settlement nearby, of the same period, were the natives of the country of a different stock from that of the Scythians. The coexistence of both populations is indicated by pottery found in Scythian burials, which was a local ware of the same type as that found in the settlement, and also by a clay model of a two-wheeled Scythian cart found in the settlement.

Of special importance was the discovery of the burial of a Scythian chief or prince in the so-called 'Small Mound' (Malii Kurgan), one of the seven barrow graves investigated in the Milskaya steppe near Kyamil-Tepe, *c.* 120 km south-east of Mingechaur dated *c.* 650–600 BC (Iessen, 1965: 22; Terenozhkin, 1971–4: 71). The prince's skeleton lay on

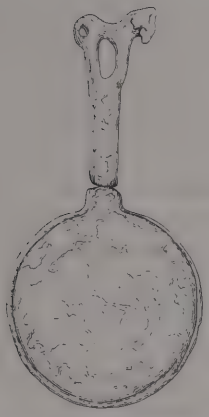

Fig. 3. A 7th century mirror from Mingechaur. (Approx. 25 cm)

Fig. 4. Malii Kurgan; bronze objects. 1, bell; 2, arrowhead; 3, buckle; 4, chamfron horse. (Scale in cms).

Fig. 5 Malii Kurgan; bronze bit and cheek pieces openwork decorated. (Scale in cms).

Fig. 6. Malii Kurgan; bronze phalerae. (Scale in cms).

its right side, and near it was a horse's skull with a bridle set on it. Nearby were 21 clay vessels that in every respect embodied age-long local pottery traditions (Fig. 7); 230 bone and paste beads and 51 carnelian beads, and a single three-edged socketed bronze arrowhead (Fig. 4, 2). To the bridoon belonged bronze bits and cheek-pieces (Fig. 5), five

bronze phalerae decorated in open work (Fig. 6), a chamfron of a thin bronze leaf decorated with small bosses and two small animal figurines in Urartian style all in *repoussé* technique, and a small bronze quadrangular bell (Fig. 4, 4) (Fig. 4, 1). Most of the articles were Transcaucasian products, though some were Urartian ones. Phalerae of the same type, and similarly decorated, were found in several graves in various parts of Transcaucasia (Iessen, 1965: 27). Typologically the bits and cheek-pieces are among the earliest metal specimens yet found (Potratz, 1966: 125 ff; Terenozhkin, 1971–4: 72).

The study of Urartian rock inscriptions in the northern part of that ancient kingdom, extending mainly over the southern part of Transcaucasia (in Armenia), led P. N. Ushakov (1946: 44) to assume the presence of the Scythians in south-eastern Transcaucasia by the 8th century BC. Archaeological remains, however, attributable to the Scythians are rather scarce (Iessen, 1965: 22; Terenozhkin, 1971–4: 71), and some scholars (Khalilov, 1971: 183) conclude, therefore that the Scythians did not play an important role in the development of the country and of its native population. Taken as a whole, however, the evidence does not endorse such an opinion.

Urartian rock inscriptions imply that the early Scythians in Transcaucasia were divided at first into a number of small pastoral tribes independent of each other. Their weakness allowed the Urartians to undertake incursions in their land and to boast of great booty in cattle, horses and slaves. But the steady contact with peoples of a highly developed civilisation and fighting with the Urartian army finally brought about the formation of larger Scythian military units under strong and able leaders, or princes. Armed with newly acquired high quality weapons, they began to menace not only the native peoples of Transcaucasia but also the northern provinces of Urartu, and gradually they built up their strength for future conquests in Western Asia in the 7th century BC.

Archaeological traces of the Early Scythians recorded so far in Iranian Azerbaijan come chiefly from the vicinity of Lake Urmia, and were mainly of the Iron IIIB period, the 7th century BC, but a grave excavated at Hasanlu, possibly of the 8th century BC, that contained skeletons of four horses may be regarded as indicating the Scythian presence in north-west Iran before the end of that century (Ghirshman, 1964: 24 ff; Dyson, 1965: 208 ff). R. Dyson (as above), who discussed remains attributable to the Scythians excavated at Hasanlu and in some other sites, dated them to the second half of the 7th century BC, but he also remarked that they might have been of an earlier date. From Hasanlu also comes a beaker with a polished grey surface, at present in the museum at Rezaiyeh (No. 92). It was found in unknown circumstances in the Hasanlu settlement destroyed in the 8th century BC. Its incised decoration, consisting of geometric figures placed on the upper part of its belly, is typical of the pottery of the Srubnaya culture of the eastern part of the Ukraine (Krivtsova-Grakova, 1955: 88, Fig. 17; Sulimirski, 1970: 258, Fig. 63). Of an early date are two bronze bits and one pair of bronze bits fastened to cheek-pieces (Potratz, 1966: 371, Pl. LV, 132), considered by Potratz as proper to Luristan.

Also of any early data was the barrow grave cemetery at Sé Girdan (Muscarella, 1969: 5–25; 1971: 5–28). Of particular interest are articles found in two of its mounds.

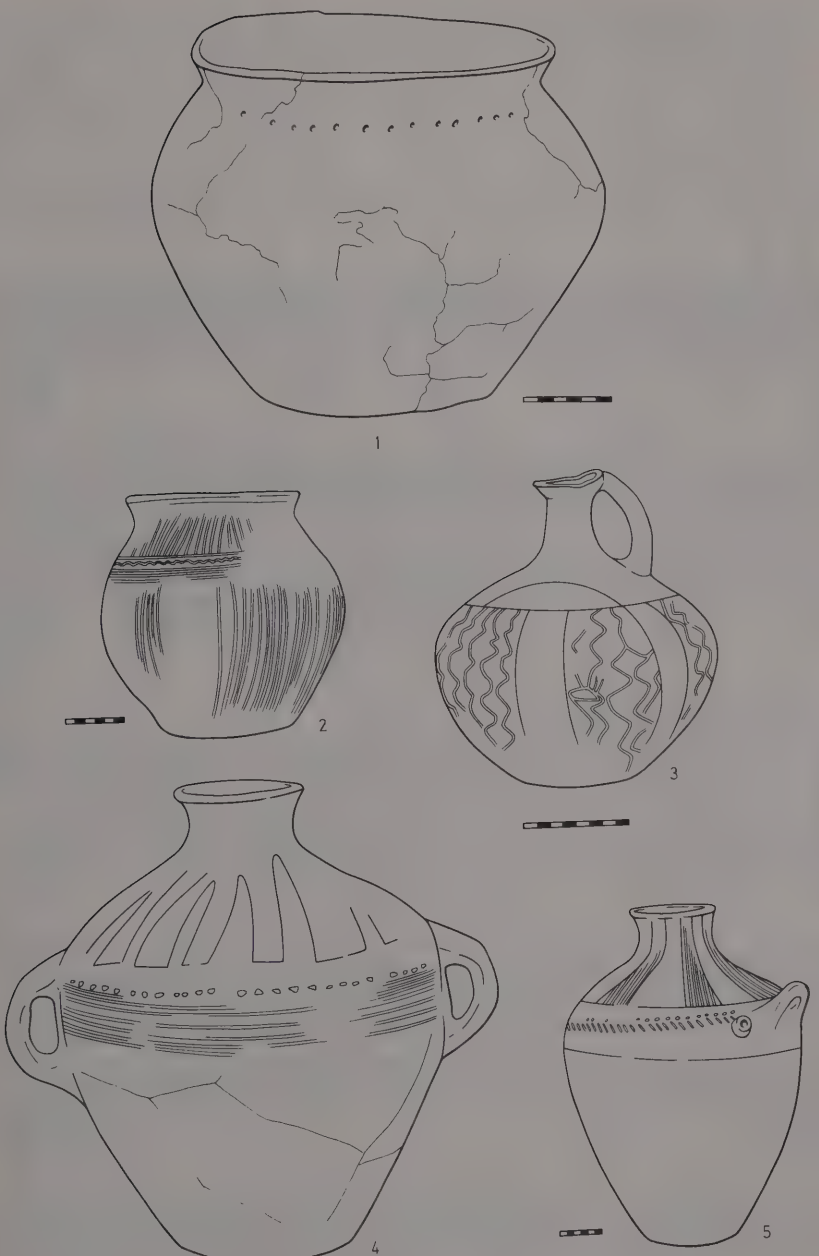

Fig. 7 Malii Kurgan; 1, handmande coarse pot; 2–5, examples of wheelmade potter black polished pottery. (Scale in cms).

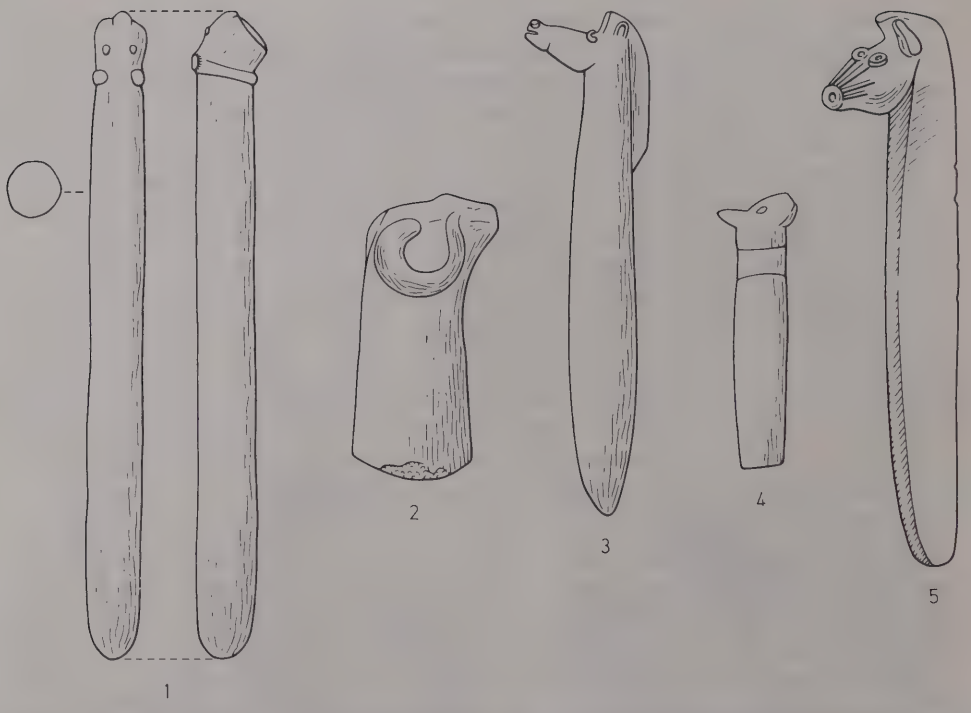

Fig. 8 Stone 'sceptres' 1, Sé Girdan, north-west Iran; 2, the Minusinsk region; 3, Semi-palatinsk, eastern Kazakhstan; 4, Luristan; 5, Buchtarminsk site, Ust-Kamengorsk region, Kazakhstan. After Muscarella (1971). (Not to scale).

In one of these, Tumulus III, a feline-headed whetstone/sceptre (Fig. 8, 1) was found near a crouched and ochre strewn skeleton in a manner proper to the Andronovo burials of the Late Bronze Age in the steppes of Kazakhstan and on the Lower Volga. The feline-headed whetstone/sceptre is of a type similar to those proper to the southern Siberia and eastern Kazakhstan, and other regions in Asia (Chlenova, 1971: Fig. 2, 212) (Fig. 8, 2, 3, 5). In Tumulus IV, three bronze axes with a single sloping rear point were found, reminiscent of specimens of the Late Bronze Age from the North Caucasian culture of the region of Piatigorsk (Sulimirski, 1970: 410, 424, Pl. 1, 5, 19). Of interest is a stone slab found in the Iranian part of Azerbaijan, at present in the Museum Rietberg in Zurich (Jettmar, 1964: Fig. 1) with a sculptured ram's head, of a type known in the Urals and western Siberia, and which most likely comes from that region brought to Azerbaijan by the Early Iranians or the Scythians. Typical of the Iron IIIB period in north-west Iran was the so-called 'triangle-ware', a well-made pottery with painted decoration on the upper part of the vessels, consisting of rows of short, or narrow and long, shaded triangles. Similar decoration, but incised, appears on vessels of the Early Iron Age culture of the Crimea, the Kizil Koba culture (Schults and Stoliar, 1958: 55, Fig. 13), and also on the

black polished pottery with white incrusted ornament from Transcaucasia, Kazakhstan and the Ienissey steppe country in Siberia (Griaznov, 1966: 33). They point to the direction in which the Iranian newcomers had proceeded.

'Scythian' socketed three-edged bronze arrowheads have been found in several sites (Dyson, 1965: 207 ff); they were in use in the Iron IIIB period and later. The earliest ones seem to belong to the late Iron IV period in north-west Iran. Four decorated bone cheekpieces (one pair and two single) found at Kaplantu in north-west Iran may also be mentioned (Metropolitan Museum of Art, New York, No. 58, 131, 1–4) (Fig. 9). They

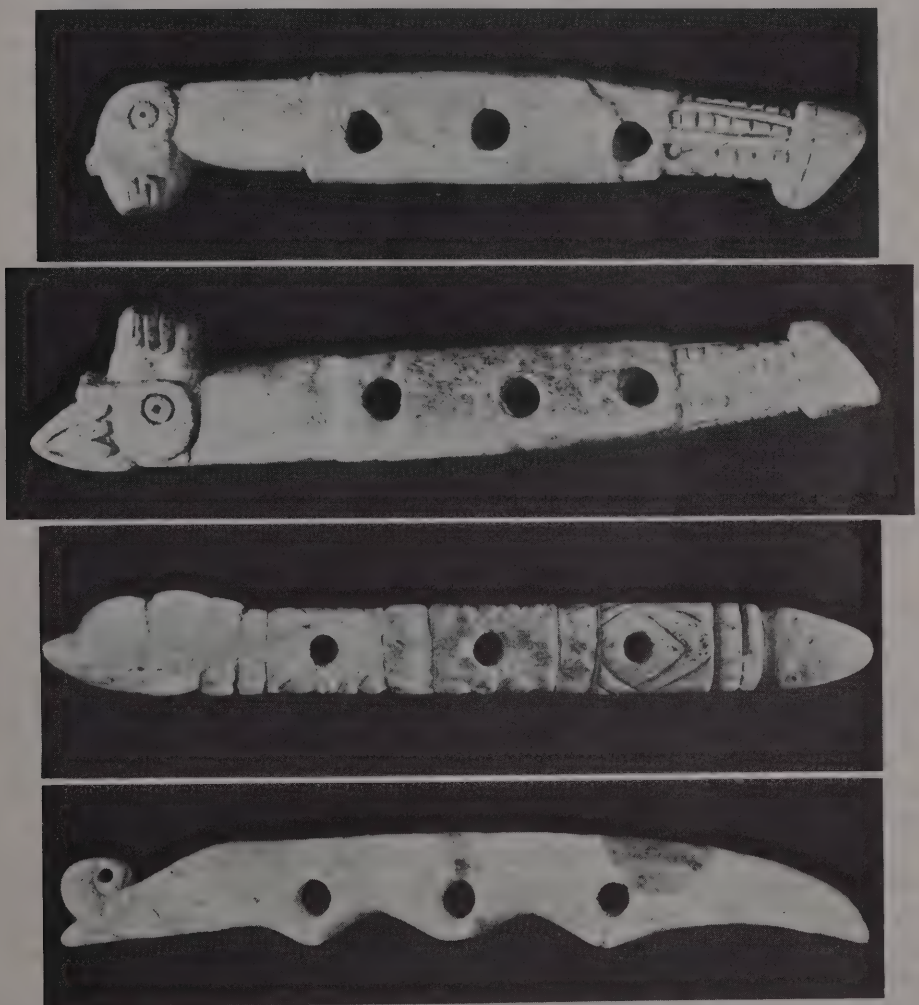

Fig. 9 Bone cheekpieces from Kaplantu, north-west Iran. Courtesy the Metropolitan Museum of Art, New York, gift of Khalil Rabenou, 1958 (Access. No. 58.131.2-4). (Not to scale).

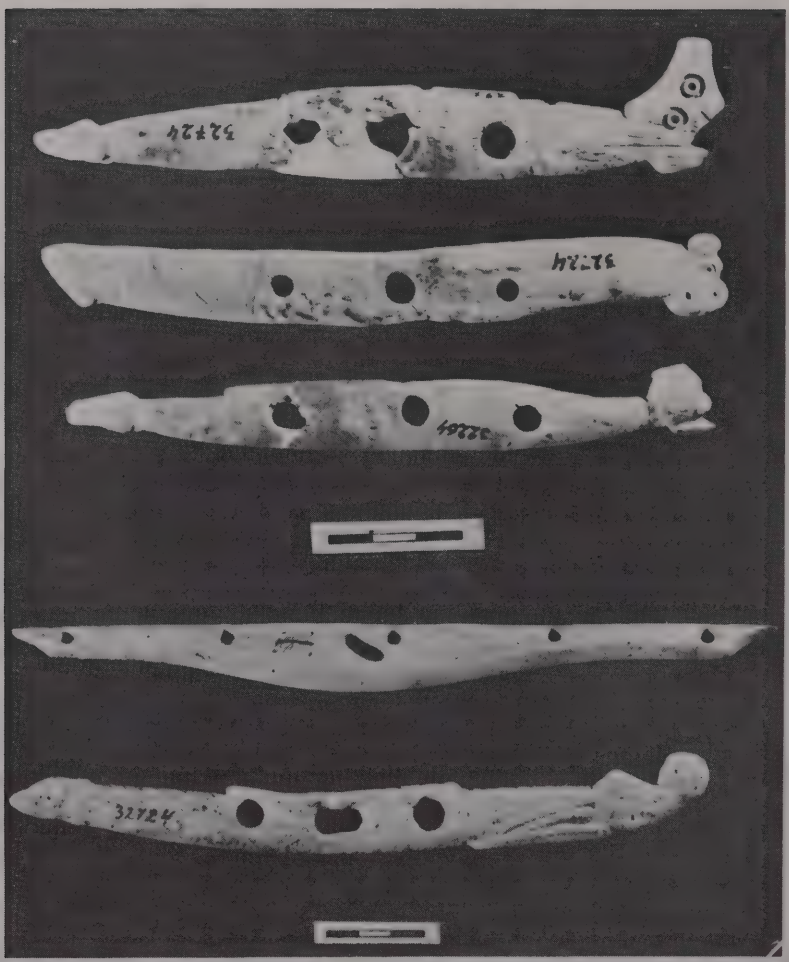

Fig. 10. Sixth century bone cheekpieces from the Ukraine. Courtesy the State Archaeological Museum, Warsaw. (Scale in cms).

considerably precede similar specimens of the 6th to 5th centuries in the Ukraine (Fig. 10).

After their arrival in Iran, but probably not earlier than the mid-7th century BC, the Scythians – at first, admittedly, only their royal family – began to adopt zoomorphic decoration. Almost all zoomorphic motifs of the early Scythian art, including the recumbent stag, are derivative from, or are simply copies of, the patterns widely applied for centuries in Oriental art (Amandry, 1965: 149 ff), being adapted later, in Europe, in varying degrees by Greek, Bosporan, Thracian or native Scythian artisans who worked in the Bosporan workshops, or in those of the Scythian aristocracy, in order to suit the taste

of their Scythian clients or masters. The original motif is mostly more or less recognisable. The beginning of this process is well illustrated in the equipment of the Ziwiye tomb. Here (Fig. 11) the prototype is shown of the 'genuine Scythian' image of a recumbent stag.

The drive of the northern nomad peoples resulted in conditions on the north-eastern frontier of Assyria in the early 7th century BC being unstable (Olmstead, 1923: 360; Melikishvili, 1954: 300). In 679 BC, the Cimmerians under their King Tushpa, and also a Scythian tribe, the Budau or Dua, crossed the Assyrian border, but were beaten by Esarhaddon (681–669 BC); Ishpakai, king of the Scythians, was killed then in the Mannaean country. The presence of a Scythian horde in the region of Lake Urmia was reported again in 674 BC (Wiseman, 1958: 9 f). At that time, a great coalition headed by Kashtariti (Phraortes), King of the Medes, to which the Cimmerians and Mannaeans also belonged, threatened the country. The Scythians did not belong to this coalition. Probably in 675 BC Esarhaddon cleverly warded off the impending danger by contracting friendship with the Scythian King Bartatua (Partatua or Protothyes of Herodotus, I: 10), a consequence of which was the defeat of Kashtariti in 674 BC and the disintegration of the coalition. The assumption of some scholars that the presence of the Scythians in Mannai, and also in Urartu, was due exclusively to their role of mercenary troops hired by the rulers of these two countries – and that on these troops depended their might and grip over their own people (Melikishvili, 1954: 313, 2) – does not seem correct. It might have been true only for the earlier part of the 7th century BC. A Scythian irruption into Urartu followed these events and resulted in a considerable curtailment of the Urartian territory in the south-east of that country, probably seized by the Scythians. Soon afterwards, Urartu and also Mannai were subdued (Chirshman, 1964: 98), and Media subjugated, probably in 652 BC (Barnett, 1962: 93). These events took place between 674 and 625 BC, but their dates and significance have variously been estimated by different scholars.

Credit for these achievements cannot be given solely to the Scythians; the important factor in these events was undoubtedly the help of and collaboration with Assyria, based on an alliance of the Scythians with Assyria contracted in the mean time. During the reign of Esarhaddon and the first half of that of his son and successor, Assurbanipal (668–626 BC), Bartatua (Patatua) was King of the Scythians in Western Asia (*c.* 678–645 BC). The coincidence of the initial date of his reign with that of the death of the Scythian King Ishpakai in 679 BC suggests that Bartatua might have been the successor, and possibly even the son of, Ishpakai (Diakonov, 1955: 6).

We may conjecture that Bartatua was well aware of the very precarious position of Esarhaddon when, in 674 BC, he had to face the strong coalition led by Kashtariti, the Mede, that decisively aimed at the destruction of Assyria. On the other hand, Bartatua must have considered himself to be powerful enough at that time to marry the Assyrian princess Seru a-eterat, the only daughter of Esarhaddon (Wiseman, 1958: 6), a marriage that connoted his full military support of Assyria. Apparently, Esarhaddon did not resent his daughter's marriage to a 'barbarian' but his fear was that 'the sacrifice' may be in vain.

His worries were recorded on the clay tablets found in the acropolis of Nimrud which contain Esarhaddon's very significant queries addressed to sun-god, Shamash, asking him: 'Whether Bartatua will speak him true words of peace; will truly say "the peace" which acknowledges his nominal submission; will he keep his oath to Esarhaddon; will he do that which is good for Esarhaddon?' (Olmstead, 1923: 359).

A proper judgement of Esarhaddon's queries and their implication is of the utmost importance for the understanding of the Assyro-Scythian relations after Bartatua's marriage. Although history does not explicitly tell us that the marriage actually took place, nor that Madyes was their son, this seems to ensue from the firm Assyro-Scythian alliance and the loyal support of Assyria nearly to the end of that kingdom by the two Scythian kings, by Bartatua, evidently bound by his oath of allegiance and, undoubtedly, also by his political considerations, and then a nephew of the Assyrian King Assurbanipal.

From the legal point of view, Esarhaddon's queries imply that Bartatua, in marrying the Assyrian royal princess, had to take an oath of allegiance to Esarhaddon. In taking it, Bartatua nominally surrendered to Esarhaddon and legally became the Assyrian King's liegeman, holding as a fief the countries ruled by himself. Accordingly, his Scythian realm might have been considered by the Assyrians as a nominal extension of the Assyrian kingdom. This agreement seems to have ensured Bartatua Assyrian help in case of emergency; probably similar were the motives that induced Esarhaddon to this deal. A proper working of the agreement seems to be attested by the subsequent events when (653–652 BC) the Assyrians, after defeating Media, left that country to be ruled by the Scythians who aided them in its conquest. Most likely, the reciprocal relationship between Bartatua and Asurbanipal, his brother-in-law and Esarhaddon's successor, was similar, as later was that of the latter with Madyes, son and successor of Bartatua.

The marriage of Bartatua into the Assyrian royal family was undoubtedly an important event, and it even appears to have been a turning point in the history of north-western Iran in the mid-7th century BC, and in particular in the history of the Scythians. The basis of the 'Scythians rule over Asia' (Herodotus I: 104) was, in fact, the treaty of the Assyro-Scythian alliance supposedly sealed by the royal marriage. After its conclusion, presumably in 674 or 673 BC, there was a peace along the hitherto turbulent northern frontier of Assyria that lasted several years. Wiseman (1958: 10) remarks that Esarhaddon probably considered he had sufficient control not to require further major operations in this region, for henceforward he concentrated in other areas.

The marriage also greatly affected the subsequent development of the Scythian culture, particularly that of the ruling family. Family links with the royal house of Assyria must have exposed the Scythian royal family to a strong impact of the Assyrian culture, which is to be inferred from the equipment of the Ziwiye burial. Also of importance was the influence emanating from Manna and Urartu, both countries under Scythian overlordship at that time, whose culture was formed under strong Assyrian influence.

At the beginning of the second half of the 7th century BC, the Scythians – still under Bartatua – ruled over a large territory which embraced Manna, Media, subdued jointly with Assyria in 652 BC (Barnett, 1962: 93), and possibly also Urartu. This was

evidently the period of Scythian predominance in Iran. But a more precise dating of this period, of the '28 years' rule over Asia' of Herodotus, is disputable and its beginning and end have been differently estimated by several scholars who have concerned themselves with the problem. A clue for its proper dating is offered in a passage in the work of Herodotus (I: 105) according to which Cyaxares, King of the Medes, 'invited the greatest part of the Scythians to a feast, and having made them drunk, put them to death; and so the Medes recovered their former power, and all they had possessed before; and they took Nineveh'. And then: 'Having accomplished these things, Cyaxares died, after he had reigned forty years, including the time of the Scythian domination'.

Cyaxares died in 585 BC; accordingly, the 40 years of his reign must have begun in 625 BC, when he succeeded his father Phraortes (Culican, 1965: 15). The above passage from Herodotus' work implies, however, that he must have been under Scythian domination for at least a few years of his early reign. It follows that Scythian domination over Media could not have terminated in 625 BC, when Cyaxares acceded to the Median throne, but must have ended a few years later, possibly around 620 BC; anyway the *terminus ante quem* for its end is 615 BC, the date of the Babylonian records that mention the Scythians as allies of the Medes. The legendary 28 years of Scythian domination over 'Asia', in fact over western Iran, should thus be assigned to the time between 650 and 645 to about 622 and 617 BC. It follows that the years of 'Scythian domination' coincide with the reign of Madyes, the successor of Bartatua, although the real founder of Scythian might was his father, Bartatua-Protothyes. The latter seems to have died in 645 BC and his son, Madyes, who succeeded him (Herodotus, I: 103), was then probably 27 years of age.

The region of Saqqez in modern Iranian Kurdistan seems to have been the political centre of the Scythians in Iran. Climatic conditions in that region were more favourable then than at present for cattle and horse rearing, since it seems at that time to have been a steppe country having an adequate rainfall (Boessneck and Krauss, 1973; Kromer and Lippert, 1976). The very important find from Ziwiye, some 40 km east of Saqquez, was discovered by a local shepherd in 1947, about halfway down the slope of a very steep hill rising to about 150 m above the valley it dominates, the altitude of which is over 2000 m above sea level. It consisted of bronze, or copper, coffin apparently washed out of the side of the hill, which contained 'a treasure of gold'. The find and its components have been described and discussed by many scholars, and controversial opinions have been expressed as to their date, origin and as to the nature of the find. Its individual pieces have been attributed to the Assyrians, Urartians, Medes and Scythians, and some have been considered works of the Mannaean artisans. Opinions also differ as to the nature of the site. Some scholars (e.g. Godard, 1962: 95) consider it to be remains of an ancient Mannaean or Assyrian fortress, possibly destroyed early in the 7th century BC by the Scythians. According to others (e.g. Ghirshman, 1964: 99), the nature of the articles found at Ziwiye implies that the site must have been the richly furnished 'grave of a great Scythian king'.

The present article was inspired by a personal inspection of the site and the material

from it in 1975. I am greatly indebted to the Research Fund of the British Academy for a grant which enabled me to travel to Iran in the autumn of that year. There, I had the opportunity of studying a large collection of archaeological remains from north-west Iran, mainly of the second and first millennia BC, at present at the Iranbastan Museum in Tehran, including most articles of the 'Ziwiye Treasure' and other contemporary remains. I should also express my sincere thanks to Dr F. Bagherzadeh, Director-General of the Iranian Centre for Archaeological Research and of the Iranbastan Museum, for his very kind invitation and help, thanks to which I was able to pay a brief visit to the site at Ziwiye in Iranian Kurdistan in October 1975; though I had no possibility whatsoever of organising even a small excavation there.

The trip also enabled me to study some archaeological remains from Iranian Azerbaijan, at present at the museum of Rezaiyeh. I greatly enjoyed the hospitality of the British Institute of Persian Studies in Tehran, and am very grateful to its Director, Mr D. B. Stronach, MA, for his friendship and help. I also profited greatly from a conference on various aspects of the Ziwiye find, which I had with Dr R. Ghirshman in Paris in December 1975. Furthermore, in April 1977, I had the opportunity of seeing several articles from Ziwiye at present in the Metropolitan Museum of Art in New York and in the University Museum in Philadelphia. I am very grateful to Dr Crowford, Miss H. Pittman and Dr O. White Muscarella of the Metropolitan Museum of Art, New York, for their assistance during my study at the Museum and for sending me a series of photographs, and also to Professor Robert Dyson of the University Museum, Philadelphia, for showing me his plan of the remains of ancient structures uncovered by him on the Ziwiye hill, and for sending me a series of photographs. The plan made during his work some years ago demonstrates how appropriate is his remark (1963: 34) that 'the cramped top of the mountain (of Ziwiye) shows that it was so restricted that there is no possibility of considering it a city or a town, although it might have been the citadel residence of a ruler'.

In his letter of 4 December 1976, Dr Bagherzadeh kindly informed me that during the first season of excavation of the site at Ziwiye in 1976 by an Iranian team, 'work was carried out on the main hill where first of all architectural remains unearthed in the past were cleaned, and the excavation continued to establish orientations and plans of the buildings. This work will have to continue, of course, for very many years.' He also adds that 'on the plain, two necropolis were discovered and excavated. A total number of 210 tombs were opened with a variety of most interesting materials.' At the time of my visit in 1975, however, the only visible and accessible site was a quadrangular structure situated on the very top of the hill, on its northern side. It consisted of two rectangular chambers built of glazed mud bricks both at present bare and empty. Both chambers were probably of the same size originally, each about 7 or 6 m by 3 or 2.5 m in area, joined at the narrow side, forming a regular rectangular block with a brick partition, orientated approximately north–south. There were no entrances, no windows, and no communication between the two chambers. The whole structure seems to have been slightly sunk in the ground. But of particular importance is the fact that the northern portion of the

northern chamber, as well as the short northern wall, are missing: the chamber stood on the brink of the eroded part of the hill and its missing part must have tumbled down and perished in the slide. This construction must have been unearthed after the last visit to the site by Professor R. Dyson as it does appear on the plan kindly shown by him to me.

The structure just described was, as far as I could judge from my rather superficial examination, not a dwelling, but most likely funerary. Its sepulchral character also seems to be attested by the bronze (or copper) coffin found on the slope of the Ziwiye hill below, since this obviously tumbled down with the eroded part of the burial chamber in which it presumably stood. Inside its broken remains a 'gold hoard' was found, the articles of which undoubtedly formed part of the equipment of the buried person, or persons, whose corpses had entirely decayed.

The articles found in the coffin were mixed up with casual finds collected from other parts of the site or around the hill and the village of Ziwiye. Many found their way to museums and private collections in different parts of the world, but the bulk are at present in the Iranbastan Museum in Teheran (Figs. 11–13). The list of the finds, completed by Dr R. Ghirshman (1973), contains 43 articles of gold, 71 in silver, 103 of ivory and/or bronze, iron, pottery and stone. There is no certainty, however, which of these articles originally formed part of the 'treasure' found in the coffin, and which came from

Fig 11 A fragment of a 7th century decorated gold plaque from Ziwiye. Courtesy Muzeh-e Irān-e Bāstān, Teheran. (Not to scale).

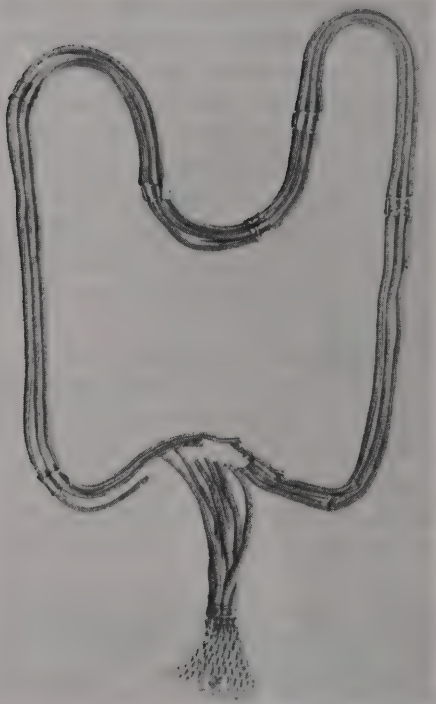

Fig 12 Gold chain from Ziwiye. Courtesy Muzeh-e Irān-e Bāstān, Teheran. MIB11606. (Overall length *c.* 50 cms).

the top of the hill and its environs. Nevertheless, the importance of the whole set in which Assyrian, Urartian, Median and Scythian currents cross each other, from the historic and artistic point of view, has been emphasised by many scholars.

Problems thus arise as to the character and date of the 'treasure' of Ziwiye found in the coffin, both as to its connection with the structures, whose remains were uncovered on the top of the Ziwiye mountain, and as to the date and significance of the latter. Furthermore, the question of the identity of the original owner of the 'hoard' found in the coffin is vital. The results of recent Iranian investigations of the Ziwiye site will undoubtedly solve many of the problems that have arisen, but even our present restricted information about this site seems to make it possible for us to suggest more or less well-founded solutions to some of the queries raised.

First, the site itself. According to R. Dyson's earlier report, the structures on the top of the Ziwiye hill might have been remains of a citadel, the seat of the ruler of the country. In a later report (1965: 205 ff), the same scholar says that his three weeks' excavation work at the site was sufficient to indicate that it was a fortified castle which contained a complicated system of corridors and small rooms surrounded by a wall some

7.5 m thick, and that there were at least three stages of rebuilding. He also suggests a date not earlier than 750 BC and not later than 600 BC on typological grounds, relating the site to Assyria and Hasanlu IIIB. The radiocarbon dates for the abandonment of the site at Ziwiye are 611 ± 56 bc (P-873) and 610 ± 45 bc (P-875). On the other hand, according to T. Cuyler Young (1965: 59, 82), the result of his study of ceramics found on the site implies that Ziwiye was a single period site, the beginning of the occupation of which falls some time between *c.* 675 and 625 BC.

One of the most important finds of the Ziwiye site is the damaged bronze coffin found on the slope of the mountain. Its remains have been described and discussed by R. D. Barnett (1956: 114 ff), who pointed out that the coffin is almost identical with two bronze coffins excavated at Ur. According to the opinion of Barnett and other scholars, the Ziwiye coffin was made earlier than the end of the 7th century, and this has been generally accepted.

The Ziwiye coffin had a rim, about 5 cm wide, with several scenes engraved on it, one of which has been preserved almost in its entirety. Fig. 14; it is at present in the

Fig 13 Silver chamfrons from Ziwiye. Courtesy Muzeh-e Irān-e Bāstān, Teheran. MIB 12485, 12486 and 12493. (*c.* ⅓ size).

Metropolitan Museum of Art in New York. According to Charles Wilkinson (1960: 219), who thoroughly studied and described the engravings, they are a typical Assyrian composition. They represent rows of foreigners, either prisoners or bearers of tribute in their different native dress, being marshalled into the presence of an official of high rank. He emphasises that 'the personage receiving tribute and those surrounding him are all Assyrians, but he is not the Assyrian king himself. It is more likely that the man who received the tribute is of more exalted rank than governor, for it is inconceivable that a governor would be represented as receiving tribute from more than one group of foreigners, a function that one suspects would be assumed only by the king himself, or by his appointed viceroy. Such a man would be of exalted rank, perhaps even of a prince or viceroy.' Among the foreign bearers of tribute identified may be the Urartians and the Medes. As to the others, Wilkinson (p. 217) remarks that 'it is not always possible to distinguish the different foreign people by dress alone'; unfortunately, there are no inscriptions on this coffin. Ghirshman (1964: 101) points to the striking resemblance that links the design on the Ziwiye rim with those of the ivory plaques adorning the throne of Esarhaddon: they differ in that the latter shows the Medes bringing tribute to Esarhaddon, whereas on the Ziwiye rim, the Medes are bringing tribute to a 'Scythian king'.

Wilkinson (p. 220 as above) rightly remarks that 'it is clear that no person of any importance would have such a coffin after this proud nation [the Assyrians] had suffered [in 612 BC] not temporary defeat but complete subjugation'. The scenes representing rows of Median and Urartian tribute bearers must have been engraved at a time when both these nations had submitted to the Scythians, or to the Assyrians. Media submitted in 652 and freed itself soon after 625 BC when Cyaxares II, that very able king, ascended to the Median throne a year after the death of the Assyrian king, Assurbanipal. Accordingly, we may conjecture that the Ziwiye coffin was made, and the scenes on its rim engraved, some time between 650 and 625 BC. The date of the personal ornaments and other articles supposedly found in the coffin, or closely associated with it, fits in well into this period; this was precisely Herodotus' period of 'Scythian rule over Asia'.

Most likely, the Ziwiye citadel was constructed – and the site occupied – during the period specified above, the zenith of Scythian power in Western Asia (Iran). At that time, up to 645 BC, the Scythians were ruled by King Bartatua, and then by his son, King Madyes. Ziwiye was supposedly then the Scythian centre. It lay in the Mannaean homeland, the extent of which 'corresponded to the known distribution of Ziwiye pottery. . . . There is a strong argument in favour of equating Ziwiye-type pottery with the Mannaeans' (Swiny, 1975: 95), and also 'the Ziwiye ceramic horizon, covering *c.* 20,000 km^2, lies between the spheres of Urartian and Median influence' (p. 93). We may add that the country must have been held by the Scythians. This follows from the fact that the country of Mannai was mentioned for the last time in Urartian annals during the reign of Rusas II (685–645 BC), and in Assyrian annals at the time of Esarhaddon (681–665 BC), both at a time when the Scythians were at the summit of their power in north-west Iran.

The said structure at the very top of the Ziwiye site was presumably the tomb of a

Fig. 14 Coffin from Ziwiye. Detail of decorated rim showing the viceroy and court officials.

high ranking person. The question thus arises as to his identity. Evidently he was neither a Mannaean nor a Mede or Urartian. The date of the construction of the burial chamber, about 650 BC, and a similar one of the coffin suggest that Bartatua, King of the Scythians, who died in 645 BC, was buried there. It may be that the tomb and some other structures were built by the Scythians on the ruins of a Mannaean fort destroyed by them. But it also seems possible that all the Scythian structures, including the tomb, were erected by King Madyes as a kind of memorial to his father, and destroyed by the end of the 7th century by the victorious and revengeful Medes. Only the results of the excavations by the Iranian Centre for Archaeological Research in Teheran will be able to answer these questions.

The identification of the person buried in the Ziwiye tomb with Bartatua seems to be very plausible. After all, Bartatua was the brother-in-law of Assurbanipal, King of Assyria, and very likely considered as a member of the Assyrian royal family, and a prince. This, and the oath of allegiance to the Assyrian king taken by Bartatua and his nominal surrender to the Assyrian king, well explain the role Bartatua presented in the scene on the rim. He might have acted as an Assyrian viceroy in charge of Media, Urartu, and possibly also of Mannai, the countries conquered by Assyria according to some ancient records, but by others (e.g. Herodotus) subdued by the Scythians, possibly with the help of, or in co-operation with, Assyria. His realm was most probably considered by the Assyrians as a nominal extension of their kingdom. At any rate, the very diverse set of grave goods of the Ziwiye tomb, which, besides the strong Assyrian share, also contained Urartian and Median elements, indicates Scythian rule over these countries at that time. All the circumstances, therefore, strongly support the view that the person buried in the Ziwiye tomb was Bartatua, King of the Scythians.

It would, however, definitely be incorrect to proclaim that the Scythian king, presumably Bartatua, was buried at Ziwiye in accordance with the 'Scythian tradition'. A tradition can obviously preserve the memory of some past events and happenings, and it undoubtedly contributes to maintaining ancient customs, creeds or usages by posterity,

but it cannot act in reverse. The Ziwiye tomb seems in fact to have initiated the tradition of sumptuously equipped Scythian royal and princely burials, a very widespread practice in the whole Scythian world during the 6th century BC onwards.

Bartatua was followed by Madyes, his son, who seems to have also been an able ruler, In his early years he defeated the Cimmerians some time after 650 BC. During his reign, the Scythians undertook a great raid on the countries south of them, invaded Syria and Palestine and approached the border of the Egyptian Empire. There is no common agreement as to the date of this enterprise: 625 BC, but also 633 or 637 BC, have been proposed by the authorities concerned. The raid was undertaken most probably with the consent of the Assyrians, whose country they must have crossed before going further south.

That the Scythian power under both Bartatua and Madyes depended to a considerable extent on their close co-operation with Assyria, was shown when Assurbanipal, the last great Assyrian king, died in 626 BC and was succeeded by weaklings; and at about the same time, in 625 BC, the young and very able King Cyaxares II ascended the throne of Media. Herodotus (I: 103) says that he was 'more warlike than his ancestors'. These fateful changes meant that time was running out not only for Assyria, which ceased to exist 16 years, later, but also for its still faithful allies, the Scythians.

We may conjecture that the grip of ageing Madyes upon the Medes under the young Cyaxares began to weaken considerably. Illustrative in this respect is the Median policy of assaulting Assyria, evidently opposed to that of Madyes, who had to defend Nineveh from them (Herodotus I: 103). The date of the latter event, which gave Assyria a short-lived respite, is uncertain, but most likely it took place around 617 or 616 BC. This was probably the last show of force by the Scythians in Western Asia and the last feat of arms of King Madyes, who seems to have died soon afterwards, as is suggested by the subsequent course of events.

As the position worsened, Psammetichus, King of the Egyptians, came to help the Assyrians, and even the Mannaeans sent contingents to their help. But – as emphasised by Sidney Smith (1925: 125) – 'the civil wars of the preceding years seem to have seriously affected the fighting strength of the Assyrian army'. It seems, however, that the decisive factor was that during the last stage of this war, when Assyria depended mainly on the Scythians for its salvation, they were fighting already against it, on the side of their erstwhile enemies. From 615 BC onwards, Babylonian records mention the Scythians as allies of the Medes. The change of sides by the Scythians was most likely forced upon them by the Medes, who presumably defeated them after the death of Madyes. Herodotus (I: 106) does not mention Madyes in his account of the manner by which Cyaxares overthrew Scythian domination; but such an outrage could hardly have happened during Madyes' lifetime, and it seems unthinkable that Madyes would be responsible for Scythian 'volte face'. Taking these circumstances into account, we may guess that Madyes died at the age of *c.* 60 years, soon after saving Nineveh from Median assault in about 617 BC.

Nineveh fell and was destroyed in 612 BC, and in 610 BC the city of Harran, the last remnant of independent Assyria, was taken by the Medes and Babylonians. Scythian

domination also came to an end; between 609 and 585 BC the Medes annexed Mannai and Urartu, and very likely the Ziwiye castle was destroyed then. The final Scytho-Median struggle is said to have taken place shortly before the war of the Medes against the Lydians, which began in about 590 BC, and ended in 585 BC. Consequently, a large part of the West Asiatic Scythians, forced by the Medes, left the country and migrated northwards into Europe.

Some authors disparage the role of the Scythians in Asia. According to I. M. Diakonov (1951), the Scythians, though they invaded Palestine, only penetrated into the kingdoms of Mannai and Urartu, but did not conquer these countries. He quotes Jeremiah (LI: 27–28) to show that not only Mannai and Urartu, but also the Scythians, were already under Median overlordship during the Medo-Babylonian war, which followed the Urartian Expedition of the Medes and lasted till about 590 BC. Median exploits at date are, however, far from precluding an earlier Scythian overlordship of countries mentioned.

The Scythians did not leave any good memory of their 'rule over Asia'. Herodotus (I: 106) says that during their rule 'everything was overthrown by their licentiousness and neglect: for besides the usual tribute, they exacted from each whatever they chose to impose; and in addition to the tribute, they rode round the country and plundered them of all their possessions'. Scythian mischief must have been long remembered by the ancients in Iran, since the 'desire of revenge upon them' was one of the main reasons of the Darius Expedition into Scythia *c.* 512 BC, over a century after the end of 'Scythian rule over Asia' (Herodotus, IV: 1, 4).

The expelled West Asiatic Scythians 'returned to their own country' in Europe (Herodotus, IV: 1, 4). But they, and in particular their ruling class, were no more the rough steppe nomads they once were. They were now experienced warriors, much better armed than their kin on the steppes of Europe. They had acquired the taste for luxuries, and were imbued, to various degrees, with elements of the Oriental civilisation. Thanks to their patronage, the splendid 'Scythian' zoomorphic art and style were born in Iran. It was an ingenious blend of artistic elements current in Western Asia, as is well demonstrated by a number of so-called 'genuine Scythian' motifs, e.g. recumbent stags, runners for reins of horn or bone, in the shape of ram or ram-bird heads, etc. (Amandry, 1965). Their prototypes may be found in various branches of Oriental art, mainly Assyrian and Urartian; such articles appear even in the earliest stages of Scythian art. A slight Greek contribution to the development of this art has been noticed quite early, but only later, in Europe, did it begin to be prominent. Motifs taken from all these sources were more or less altered by the artisans concerned, and adapted to suit the taste of their Scythian masters, namely members of the royal families and aristocracy. Orders from the latter, and their subsequent approval of the delivered masterpieces, and also of the more modest products of the Bosporan, Greek or Scythian artisans at the royal and aristocratic 'courts', must be considered as one of the important factors in the development of the specific Scythian art style. Undoubtedly, this patronage contributed considerably to the survival of a number of 'genuine' old Scythian motifs, which were in fact motifs derived from

ancient Oriental art. Many of these survived to the end of the Scythian rule in Scythia and subsequently were taken over by successive rulers of that country and their neighbours.

Several articles found at Ziwiye were genuine Assyrian or Urartian objects unaffected by any other influence. Such articles have also been found in a number of Scythian burials in Europe, where they are usually considered as either commercial imports, or, more often, as spoils brought there by the Scythians from Western Asia during one of their several raids into the ancient Oriental countries. Such views do not take into account either the date or the character of these 'spoils', and, above all, the distances that separate the European sites in question from Western Asia, and the fact that the 'raiders' would have had to cross many hostile countries twice (in going south and on returning) as well as several Caucasian, Armenian and West Iranian mountain passes. Finally, as M. I. Artamonov has pointed out (1975: 101), this view disregards the Assyrian and other written records which depict the Scythians in Western Asia (Iran) as intruders who settled either temporarily or permanently in some defined areas.

According to M. Rostovtsev (1931: 406), M. I. Artamonov (1968: 44) and other scholars, the north-west Caucasus was the main centre for the creation of Scythian culture and art. This relates, however, to a later stage in their development: their embryonic, earliest stage is represented by the Ziwiye set of remains. It preceded by nearly a century all Scythian relics in the Caucasus and in the Ukraine, including the splendid masterpieces of 'Scythian' art. The earliest articles of Oriental origin found in the countries north of the Caucasus Mountains, e.g. the gold mirror from Kelermes, have been dated at about 575 to 550 BC. Genuine Assyrian or Urartian articles found in Europe were manufactured not later than the end of the 7th or the beginning of the 6th centuries BC, at a time when the Scythians were still able to provide themselves with these.

The greatest number of oriental articles mentioned above were found in the earliest Scythian royal or princely barrows in north-west Caucasus, in an area where evidently a large group of the southern newcomers must have settled. But there, Assyrian or Urartian master-craftsmen were no longer available: their place was then taken by Bosporan, Greek and possibly also Transcaucasian masters; thus, the era of the new 'Scythian' art and culture began.

Scythian burials that have yielded West Asiatic articles, or their imitations, have also been recorded in Europe, north of the Caucasus. They appear singly, scattered over considerable distances. The nearest to the north-west Caucasian group, represented by barrow graves at Kelermes, is the cremation burial under a low mound uncovered at Alekseevka on the river Kalitva, a tributary of the lower Donets in the Ukraine, about 500 km north of Kelermes (Mantsevich, 1958: 196–202; 1961: 77–80). Next is the Litoy-Melgunov barrow grave near Kirovgrad in the Ukraine, about 650 km west of the burial at Alekseevka. Two such burials were found further west, in Central Europe. One of these, at Zöldhalompuszta in north-eastern Hungary, at a distance of over 800 km west of the Litoy-Melgunov barrow, dates to the end of the 6th century BC. In this cremation burial, besides a gold plaque in the shape of a stag, a plaited electrum chain was found

with three small figurines of lions affixed to it. According to K. R. Maxwell-Hyslop (1971: 208), the chain represents a Scythian imitation of the much finer necklace from Ziwiye (Fig. 12), which could have been brought to Hungary in the course of Scythian movement from Western Asia via Eastern Europe. A similar gold plaited chain was also found in the Scythian burial at Witaszkowo (Vettersfelde) and in Western Poland recently published by Bukowski (1977); it is nearly a replica of the Hungarian item. Two similar but slightly later gold chains of the 5th century BC also deserve mention. One of these was found in a barrow of the 'Seven Brothers' group on the Taman peninsula, close to the north-west Caucasus. The other one was found round the neck of a skeleton in barrow grave No. 101 at Zolotonosha near Cherkassy on the eastern side of the middle Dnieper in the Ukraine. Included in this list may also be the Assyrian chalcedon seal with carved figures of a horse and a bird (eagle), found in barrow grave 19 at Kholodnii Yar near Smela in the Ukrainian forest-steppe west of the Dnieper. In barrow grave 20 of the same site a bone knob, carved in the lion's head shape, was excavated; it was presumably of Assyrian provenance. The site lies about 60 km north of the Litoi-Melgunov barrow grave and some 50 km south of the Zolotonosha barrow mentioned above. All these articles are of the 6th century BC and were found in graves of the late 5th century BC (Pokrovska, 1957: Figs. 1, 2).

The west Asiatic articles found in Europe north of the Caucasus are presumably the latest traces of the West Asiatic Scythians, or their descendants, and they probably attest to the presence there of members of the princely families or of their representatives.

Abstract

The paper reviews evidence for the movement of Scythians into north-west Iran and considers Scythian links with the royal house of Assyria. It is postulated that the Ziwiye treasure may have been associated with a damaged bronze coffin found on the site with decoration showing tribute being brought to a (probably) Scythian king. A suggestion that the date of the coffin and therefore the treasure might be that of the Scythian/Assyrian alliance, 645–615 BC, is put forward.

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ASE *Arkheologicheskii Abornik*, Ermitage, Leningrad
ESA *Eurasia Septentrionalis Antiqua*
JNES *Journal of Near Eastern Studies*, Chicago
KSIAM *Kratkie Soobshcheniya Instituta Arkheologii*, AN USSR, Moscow
KSIIMK *Kratkie Soobshcheniya Instituta Istorii Materialnoy Kultury*, Moscow
MMAJ *Metropolitan Museum of Art Journal*, New York
MAG *Mitteilungen der Anthropologischen Gesellschaft*, Wien
MIA *Materialy i Issledovaniya po Arkheologii SSSR*, Moscow
SA *Sovetskaya Arkheologiya*, Moscow
VDI *Viestnik Drevney Istorii*, Moscow

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Australia Before the Europeans*

by D. J. MULVANEY

Twenty years ago, few white Australians were concerned with Australia before its European occupation, and black Australians were neither encouraged to record, nor instructed in the means of recording their past. Perhaps this ignorance of prehistory explains why Gordon Childe's homecoming in 1957 was either ignored by the media or treated at the level of banality, whereas visits from overseas celebrities in Classical Archaeology were newsworthy. Even when his tragic death in October attracted notice, few were aware that he was one of Australia's most prolific, influential and most translated authors. Unfortunately, Childe must have been four months in Australia before word of his presence filtered through to me at Melbourne University, although I was offering the only teaching in European and Pacific prehistory then available at any Australian university. I met him at Melbourne airport exactly one month before his death, where he was interviewed by a solitary newspaper reporter. He had flown to Melbourne to address the Australasian Book Society, one of whose members alerted me to his impending visit. The result was that Childe consented, at three hours notice, to lecture also to my university class: he chose the theme of his just completed book, *The Prehistory of European Society*.

The radical intellectuals who sponsored Childe's visit probably honoured him primarily as author of *How Labour Governs*. This provocative, angry and influential study, published in 1923, remains a classic on the meagre shelf of significant Australian political philosophy.[1] Expecting to hear more radical wisdom, the Society members were unprepared for his scathing and amused contempt as he contrasted the vigour of tiny Iceland with complacent urban Australia. With scant praise for his homeland's cultural attainments, he found little to commend except the enterprise of the outback miners of Broken Hill, whom he had visited. His pessimistic conclusion to *How Labour Governs*

[1] It is regrettable that such an important book was omitted from the chronological bibliography of Childe's works published in *Proc. Prehist. Soc.*, 1956. It is a work of philosophical depth, and as Gathercole (1976: 5) has perceived, it is essential reading for the student of his archaeological theory. F. B. Smith contributed an insightful, but regrettably brief foreword, to the reprint of *How Labour Governs* (Melbourne University Press, 1964). In his original preface, Childe sounded a note of responsibility which has contemporary relevance in British politics. Childe excluded discussion of the events of 1921 from his study, 'because my personal association with a Labour Government, as private secretary to the ... Premier ... would make any revelation of the inner history of that period without breach of confidence difficult'.

*The second Gordon Childe Memorial Lecture given at the Institute on 1 March 1977.

(1964 (1923): 181), published while he was synthesising the brave new prehistoric European world, that became *The Dawn,* merits quotation here:

> 'The Labour Party, starting with a band of inspired Socialists degenerated into a vast machine for capturing political power, but did not know how to use that power ... except for the profit of individuals ... Such is the history of all Labour organisations in Australia, and that is not because they are Australian, but because they are Labour.'

I drove Childe up into the moist eucalypt forest of the Dandenong Ranges, in a vain search for lyre-birds in their natural habitat. I gained the impression that although he kept outside current Labour Party issues, he felt that his critique remained valid. He felt deeply pessimistic about the Australian body politic and this must have embittered his closing days and increased his loneliness in the Australian crowd.[2] He spent some time as the guest of Dr H. V. Evatt, leader of the Australian Labour Party.[3] Evatt had been a Sydney undergraduate with Childe, when they shared political enthusiasm and involvement. Evatt presided over the virtual disintegration of his party in 1954–5, and Childe deplored the decline in his influence. Even as a young man, Childe had taken some wry pleasure in the fact that the second name of both friends was Vere. It was Evatt who convinced the Council of the University of Sydney that it should award Childe a senior doctorate in 1957, although a lifetime earlier it would not appoint him to a minor post. Perhaps Childe had the last word, for on the day of the conferring he wore a green shirt.

No reader of *How Labour Governs* could accept Childe's statement (1958: 69) that it resulted merely from 'a sentimental excursion into Australian politics'. To that cause he devoted over six years of total commitment. During the First World War, he played a prominent role in defending civil liberties at a time when a non-enlisted man might have been expected to have been more circumspect about attracting attention. It provides some insight into Childean psychology that he cut himself off so completely that he never again involved himself in Australian affairs. In 1957 he retired from European prehistory with equal premeditation, resolve and aloofness.

Childe is remembered today in the Australian Capital Territory for his prehistory. At the Australian National University the Prehistory seminar room is named in his honour. Childe visited museums during his last months, and while in Melbourne he examined artefacts from my first field excavation at Fromm's Landing. He exhorted a greater interest in the welfare of museums in a radio broadcast shortly before his death. At Melbourne airport he told his interviewer,[4] 'that if Australian aboriginal archaeology were given

[2] Childe-watchers should note that one subject to which he returned in conversation was his sense of depression over the death that year, after a painful illness, of his friend, Professor Sean P. O'Ríordáin. It merits record that when he landed at Melbourne airport Childe was offered the alternatives of private hospitality by members of the Australasian Society of Authors, or a room at the Melbourne Club. He chose the latter. I contributed an obituary of Childe to *Historical Studies – Australia and New Zealand,* 8 (1957): 93–4.

[3] On Childe's friendship with Evatt, see Tennant, *Evatt Politics and Justice* (Sydney, 1970), esp. pp. 20–2, 32, 356.

[4] *Melbourne Herald,* 19 September 1957.

enough study, it would show some interesting results'. Wise and helpful words, but an hypothetical utterance. In 1957 the facts of Australian prehistory were minimal. While the two post-Childean decades have witnessed both a surge of archaeological discovery on a global scale and challenging re-evaluations of the human past, no region has been transformed more dramatically than Childe's homeland. It is appropriate that the second Childe Memorial Lecture should take as its theme, Australian developments since 1957.

During 1957 Norman B. Tindale published his personal appraisal of Australian prehistory. It drew upon a lifetime of knowledge of Aborgines, one major and several minor excavations and four radiocarbon dates. A year later, F. D. McCarthy produced a synthesis based upon his field and museum experience, chiefly in New South Wales. In Victoria, Edmund D. Gill had produced a series of papers which introduced geomorphological and environmental elements into the human past, particularly in his analysis of the Keilor region. By 1957, Gill also had four radiocarbon dates upon which to hinge his argument. However, his claims for Pleistocene evidence for man then lacked the clinching stratigraphic and cultural associations. Tindale, McCarthy and Gill were the outstanding pioneers of Australian prehistoric research.[5] All were museum officers, but none was designated curator of archaeology. Apart from my own work, carried out as a lecturer in history at Melbourne University, no university supported the prehistory of the Pacific world. Radcliffe-Brown had founded Australia's sole anthropology department at Sydney over 30 years earlier, but it still lacked a single prehistorian. All physical anthropology carried out by Australians was performed by anatomists in their spare time; no full-time lecturer worked in that field. No Australian state had enacted any antiquities legislation, and so there were no public service archaeologists. As for the Aboriginal people, 19th century museological philosophy ranged them firmly amongst the flora and fauna of natural history museums. Some advances had been made by 1957, but the inherited showcase arrangements usually presented a shredded and fragmented culture. Ironically, it was Baldwin Spencer, the pioneer anthropologist, who reinforced this interpretation. As director of the National Museum of Victoria from 1899, he attempted to display Australian fauna in integrated family and habitat groups. Yet the world's richest collection of Aboriginal material was exhibited under taxonomic criteria: 'for example, the forms of shields used in different tribes are shown in one case, boomerangs in another, sacred and ceremonial objects in another' (Spencer, 1901: 5). The vital organic unity, social reciprocity and striking variety of ecological adaptation of Aboriginal societies were obscured. Few Aborigines would have entered these white man's museums by 1957, which is perhaps as well. So many secret objects and regalia were displayed there openly, that traumatic consequences may have followed their recognition by an unsuspecting traditionally oriented Aboriginal visitor.

In 1977, there are perhaps 50 or more academically trained prehistorians in Australia. Prehistory is taught at several universities, although not yet in all the burgeoning anthropology departments; physical anthropology is included in courses at two of them. All major state museums have staff archaeologists. The Australian Government has

[5] My personal evaluation of these pioneer syntheses is given elsewhere (1961, 1975).

before it recommendations for a major upgrading of museums, particularly in regard to conservation and storage, and for the creation of a national Museum of Australia.[6] This includes a Gallery of Aboriginal Australia, a major concept involving direct Aboriginal participation at all levels. Every Australian state has enacted legislation to protect Aboriginal antiquities and some have now moved belatedly to include European relics. Since 1961, the Australian Institute of Aboriginal Studies, established by the Federal Government, has funded, encouraged and co-ordinated academic research in all relevant branches of research, recording and training. The same Government established the Australian Heritage Commission in 1975, to assist the protection of the vanishing National Estate. Its scope includes both the natural environment and the built environment, and it aims to compile a site register of the National Estate. Most states are already involved in major Aboriginal site recording programmes in conjunction with the Australian Institute of Aboriginal Studies.

This achievement of an active administrative superstructure within a few years is a vital advance, but of course it is far from ideal. There is too little money, too few experts and the area is far greater than the whole of Europe. Let us turn now to archaeological and human considerations. In 1961, I assembled 17 radiocarbon dates in my survey of Australian prehistory (Mulvaney, 1961). Some 1,700 radiocarbon dates are available today from archaeological sites, or those where environmental issues impinge upon the conditions of human occupation. Whereas in 1957, the oldest dated site positively associated with a human presence was around 9,000 years, an age of 40,000 years is virtually certain at Lake Mungo. Three sites in south-eastern Australia (Mungo, Lake Arumpo and Keilor) and one in the south-west, (Devil's Lair) certainly well exceed 30,000 years (Fig. 1). These sites represent the furthest distance from any presumed tropical coast landfall, from which latter incident must be inferred mankind's earliest successful crossing of a major water barrier: the Wallace Line was crossed at least 40,000 years ago. There was no Bass Strait, however, when men reached Tasmania, now proven to date from at least 23,000 years ago. This was some 10 millennia before rising sea level separated the Tasmanians – the original Australian colonist stock – from the mainland for the balance of prehistory. Further north, Torres Strait dates only from some 8,000 years ago. Consequently, for the greater part of Papua–New Guinea prehistory, already dated back to 26,000 years ago (Kosipe), that island was connected across the whole of northern Australia.

I am concerned to direct attention to the Aborigines, whose prehistory has been exhumed and aged by a further 30 millennia during the passage of post-Childean time. This is a personal assessment and further details are provided in my recent publications (Mulvaney, 1975, 1976a, b).

So many significant discoveries and re-evaluations flow from the Australian data that I must concentrate upon those impinging upon the less tangible conceptual and

[6] *Museums in Australia 1975*: Report of the Committee of Inquiry on Museums and National Collections, including the Report of the Planning Committee on the Gallery of Aboriginal Australia (Australian Government, Canberra, 1975).

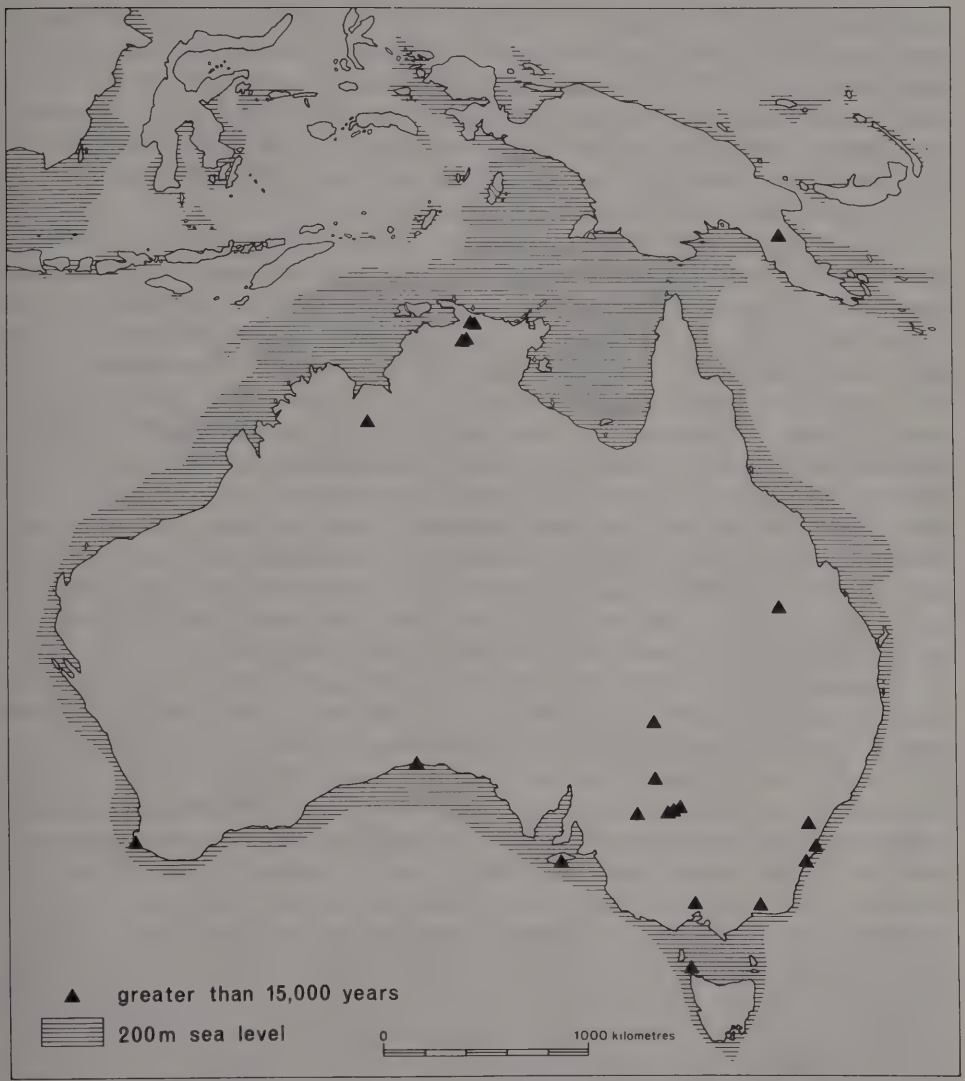

Fig. 1 The approximate shape of Pleistocene continental Greater Australia and the earliest dated occupation sites.

ideological aspects of cultural attainment. I wish to redress the balance of Eurocentric distortion which relegated Aboriginal society to a backwater of human development and converted it into a storehouse of fossil customs. Just as the marsupial fauna was considered a crude and quaint evolutionary relic, Baldwin Spencer (1901: 12) pronounced, that 'the Australian aborigine may be regarded as a relic of the early childhood of

mankind left stranded in a part of the world where he has, without the impetus derived from competition, remained in a low condition of savagery'. Like Spencer's other description of them (1904: XIV), as 'naked, howling savages', this was virtually a scientific gloss upon William Dampier's 17th century aphorism: 'the miserablest people in the world'. Unfortunately, therefore, evolutionary biology bolstered those convenient deities of righteousness, Providence and Progress, in the denigration of Aboriginal creativity and offering a rationale for the extinction of that society.[7]

The earliest skeletal evidence from Lake Mungo establishes that the people responsible for the innovations and concepts inferred from the archaeological data were fully modern *Homo sapiens sapiens.* The 30,000 years old male and the 26,000 years old female from Mungo are within the morphological range of modern Aborigines. The gracile female had been cremated by the lake shore and then buried. Careful examination of the bones and their disposition makes this conclusion inevitable. It constitutes the earliest recorded occurrence of this burial rite in the world and must testify to complex notions concerning life and death. Other archaeological discoveries in that region and in Tasmania establish the continuance of cremation practices into the 19th century. The second individual was given extended burial in a grave and had been coated with powdered ochre, which subsequently stained the sourrounding sand (Thorne, 1976; Bowler and Thorne, 1976). Significantly, excavations on the foreshore some hundreds of yards distant already had recovered a number of red ochre pellets, foreign to the site, in stratified contexts firmly dated back to beyond 32,000 ± 1,500 years ago.

Pigments are a recurring find on numerous Pleistocene occupation sites around Australia and Tasmania. 'Crayons' with ground facets, and an ochre-impregnated sandstone grinding slab date from around 19,000 years ago in Arnhem Land. The extent of ochre traffic may be gauged from the Yarar rock shelter, Northern Territory, visited throughout recent millennia. The area excavated produced some 20,000 ochre fragments, weighing 183 kg. Perhaps the most impressive testimony to this prehistoric industry is at Wilgie Mia, in the Western Australian iron belt, where thousands of tons of rock were removed through the use of stone mauls and wooden wedges. Evidently a concern with colouring material, involving considerable investment of time and labour, spans the spectrum of Australian prehistory. In the Lake Eyre region, ethnohistoric sources indicate its scale. Large, planned, ritual journeys were periodically made to the south, involving distances greater than 300 miles to collect ochre. In its turn, these gift exchanges were often distributed a further 300 miles further north in a ceremonial cycle involving Pituri, the narcotic plant, and sandstone mortars. The mobility of these social and economic enterprises provides a model for estimating the rate of exchange of goods or ideas in comparable societies.

[7] It is relevant to cite the opinion of the literary tourist and friend of Queensland landowners, Anthony Trollope (1871): 'Of the Australian black man we may certainly say that he has to go. That he should perish without unnecessary suffering should be the aim ... But no good can be done by giving (him) ... a character which he does not deserve, or by speaking of the treatment which he receives in language which the facts do not warrant'. In this savage land, he concluded, the white landowner needs to be 'not savage, but ruthless'.

Fig. 2 Place names mentioned in text.

No rock paintings of great antiquity have been authenticated, although several major galleries in northern Australia occur on sites where ochre was found stratified well back into the Pleistocene, hinting at a possible aesthetic continuity. However, ancient rock engravings have been recorded. Koonalda Cave contains abraded grooves and finger markings, in total darkness beneath the Nullarbor Plain. Some of these were covered by a rock fall 20,000 years ago. In Cape York, a more complicated frieze of pecked designs at Early Man shelter, near Laura, was already deeply weathered before hearths covered it 13,000 years ago. The Koonalda grooves are matched across the continent at Ingaladdi, where they already fell as rubble, disintegrating off the rock face 4,000–6,000 years ago. In this same area only 40 years ago, comparable grooves were rubbed during rain-making ceremonies. These rituals also involved the use of calcite crystals, and specimens were excavated in the Ingaladdi deposit. It is relevant that exposed rock surfaces right across Australia contain deeply weathered engravings, usually consisting of grooves, bird tracks

and circle motifs. These designs are repeated in Tasmania, particularly at the impressive Mt Cameron West site. Were such artistic traditions, together with cremation burial practices, part of the invisible baggage of the first Tasmanians?

Items of adornment may be inferred to constitute markers of individuality and self-awareness. Apart from the problematical cosmetic use of ochre, described above, recent discoveries hint at personalised activities and ownership. Some of them are relatively recent, but others are older. When taken in conjunction with the antiquity of diverse burial practices and the long-standing artistic tradition, they are salutory reminders that in the growth of society during the late Pleistocene, creativity was no Old World racial or geographic monopoly.

Devil's Lair, 14,000 years ago, offers the first significant decorative device, where segments of kangaroo fibulae were cut and smoothed in such a manner that they must have been worn as beads. Much later, but still 5,000 years old, are two perforated stone pendants excavated at Graman. Several burials at Roonka, South Australia, contain grave goods back to 7,000 years ago which parallel decorative devices in use in that region at the time of European contact. For example, native cat mandibles and a fossil oyster shell, were drilled for suspension; a child wore a necklace of reptile vertebrae; one burial had a chaplet of wallaby teeth, each tooth held secure with notches (Pretty, 1977). The most unique Australian find is a necklace worn by Lake Nitchie man, buried some 7,000 years ago. It consisted of 178 teeth of Tasmanian Devil (*Sarcophilus harrisii*), all pierced. As a minimum number of 47 animals provided the assemblage, and as this species has been extinct on the mainland for perhaps 3,000 years, it reflects man's predatory role in the Australian environment. As Aborigines introduced the dingo over 3,000 years ago, this combination of man and dog proved a scourge of small marsupial species. Probably the two native carnivores, Tasmanian Devil and thylacine (Tasmanian tiger), could not compete. Yet archaeological evidence accumulates that both species were once widely distributed in diverse habitats. Vivid rock paintings of thylacine were discovered recently in Arnhem Land, far beyond the previously known range of this species. This is a reminder that the potential of Aboriginal art for revealing accurate details of fauna, ethnographic possessions and the indigenous version of the impact of Europeans, has been undervalued as source material.

The evidence hints at two other matters meriting investigation. Nitchie man had lost his upper incisors during his life. As ritual tooth avulsion was widespread at European contact, it is possible that the practice was an ancient one. The second problem concerns clothing. Bone awls and other polished or split points are found on Pleistocene sites across southern Australia. A century ago Aborigines in these regions wore large cloaks of possum skins. Each pelt was decorated on the underside and was stitched with sinews, using awls, comparable to the archaeological specimens. Such apparel may have assisted adaptation to colder Pleistocene climates and facilitated man's approach to glaciated Tasmania, over 20,000 years ago. There is supporting evidence near the Victorian alps, at Clogg's cave. Several pebbles were excavated there in a terminal Pleistocene context, which possess a deep sheen, suggestive of a function as burnishers to soften skins.

In the technological and economic spheres there were several major innovations, resulting from Pleistocene initiatives. The Arnhem Land stone axes dating from between 18,000 and 23,000 years ago, are well known. Their cutting edges were ground, while some possessed hammer dressed grooves, presumably pecked out to facilitate hafting of handles. The synchronous use of resin as a fixative is testified by the discovery of resin on two stone flakes at Devil's Lair. No other region of the world, except for Japan, has such ancient evidence for ground stone technology. In the arid interior, a different implement was devised to work the stunted, knotty hardwoods. The stone tipped chisel (tula) is typologically diagnostic back to perhaps 10,000 years ago, and its step-flaked stone tip has no parallel outside this continent. Its invention combined efficiency, portability and general utility in a simple guise. By the same date, boomerangs were also in use. The recovery of aerodynamically shaped fragments from Wyrie Swamp suggests their use in fowling. This activity was intensively developed over south-eastern Australia in recent times. However, insufficient attention has been paid to the investment of labour and the extent of group activity which was expended on fowling, fishing and eeling. Significantly, these activities are richly illustrated in Arnhem Land art. Drives, large nets and complex traps were involved in the south-east, and the Wyrie Swamp finds hint at major enterprise 10,000 years ago.

It is significant that even 30 millennia ago, inhabitants around Lakes Mungo and Arumpo practised a diversified economy. They imported ochre and some stone resources from localities yet to be determined. They ate a variety of terrestrial marsupials and emu eggs, but they also harvested lacustrine resources, both molluscan and fish. In this same region, at least by 12,000 years ago, they oriented their economy towards the grinding of wild grass seeds to obtain carbohydrate in quantity. From that time, large sandstone mortars were used throughout the arid regions and were a characteristic component of the recent economy. Consequently, in chronology as well as in form and function, these artefacts parallel the grindstones of the Middle East, which are claimed there as harbingers of agriculture.

These tantalising archaeological clues are being supplemented through the close scrutiny of rich ethnohistorical and museum objects. The complexity, volume and great distances involved in ceremonial exchange networks are becoming evident as a dynamic aspect of prehistory. It has been realised, unfortunately belatedly, that there is still scope for the systematic study of Aboriginal groups in the field, whose life style remains firmly oriented towards traditional ways. The forlorn pioneer of Aboriginal cultural ecology was Donald Thomson. His brilliant insights only now are being supplemented by detailed field investigations. The young investigators have comprehended the seamless web of intellect, linking anthropology, archaeology, history and environmental studies, and do not concentrate exclusively on one discipline.[8] More importantly still, they are striving to live in mutual understanding with the people amongst whom they work. Rather than the sterile

[8] Exemplars are N. Peterson (1976), Rhys Jones (1973), Betty Meehan (1975) and H. R. Allen (1974, and unpublished work in Arnhem Land). Peterson and Jones have extensive publications in preparation.

exclusiveness (professional/informant = master/servant) which vitiated much earlier anthropological research, this new synthesis is destined to rewrite the intellectual status of man in Australia, in addition to his prehistory.

Without mythologising a new noble savagery, old shibboleths must be abandoned and the Aboriginal past assessed positively. The stereotype of a unitary Aboriginal culture, unchanging in time and occupying an unchanging environment, has gone. Not only did major environmental fluctuations or regional variations occur through time, but some of these phenomena were assisted by man the hunter, with his firestick and his dog. Similarly, Aboriginal responses over time have been both dynamic and opportunistic and possessed regional diversity. Despite the hints of a general continuity over 30 millennia in economy, technology and ideology, this may prove to be the consequence of present superficial knowledge and lack of detailed regional archaeology. There must be room, also, for change due to accumulated societal wisdom. Despite European opinion to the contrary, at the time of contact Aboriginal society was not parasitic. There was foresight in its regional economic dispositions, with considerable investment of skills and time directed towards creative spiritual goals. This allowed men more leisure to devote to art, myth and ceremonial than all but a few Western artists and composers, at that time dependent upon aristocratic patronage; its women worked fewer and less monotonous hours than those in peasant agrarian societies and probably enjoyed more dialogue with their children. There was close social bonding, and cultural interdependence, based on a ceremonial cycle of exchanges and obligations, which probably involved more direct person-to-person contacts than in agrarian European societies. There was a sense of territory and identity with the land, which made strident European nationalism appear superficial.

This alternative world view, with its different values, expectations and material manifestations, must be an artefact of over 40 millennia of accumulated tradition. It poses problems for well-intentioned white Australian governments, humanitarians, educationists and also archaeologists, who expect to transform it rapidly or to research projects on demand. The existence of a viable tradition is a reality to which Europeans must adapt, although until recently all concessions have been expected from the other quarter. Australia's now abandoned policy of 'assimmilation' assumed that the right change was from 'theirs' to 'ours'. The moral for archaeologists is that the past *does* survive in the present, and that often it is impossible to disentangle prehistoric sites from some form of contemporary Aboriginal involvement. Likewise, Aborigines simply do not live by bread alone. It is essential that objective archaeology should include the quantification of food resources, artefact use wear patterns, the determination of seasonal exploitation strategies or adaptations to environmental fluctuations. Yet the resulting data are unlikely to permit an understanding of the lifeways of that society. Archaeologists of Australia must be prepared to risk the slur of subjectivity by also concentrating upon the fringes of archaeological visibility. They must also be prepared to have well-formulated proposals for field strategy or analytical models for field verification, rejected by the Aboriginal communities in the area of their chosen study. In 1957, potential archaeologists could

work virtually unrestricted by law, and even in an Aboriginal Reserve they needed permission only from the government administration and the relevant mission authority, not the people themselves. Today, they work subject to permits under appropriate statutes, but in areas where there are Aboriginal communities the ultimate authority rests with the community council or elders.

The post-Childean archaeological revolution coincides in time with drastic reappraisals of government policy towards Aborigines, with the dawn of a self-concious black nationalism, with the struggle for legislative recognition of Aboriginal land rights, with the discovery of vast mineral wealth on land hitherto largely unoccupied by Europeans, including Aboriginal Reserves, and with the movement of Aboriginal activists into the fields of higher education and public administration. Archaeological discoveries have assisted many Aborigines, particularly urban people, in their search for an Aboriginal national identity and a cultural self-awareness. To people claiming a share in the land it seems relevant that human time in the continent since Captain Cook is simply 1% of the total. Some sensitive leaders detect a note of racism in the term 'prehistory', on the grounds that if the white man has 'history', the other term refers to an inferior category. History is *not* something written down to a people without writing. I recall the emotional outburst by a traditionally oriented Arnhem Lander who heard me talking on Aboriginal origins. What upset him was the compliment I tried to pay his people, when I observed that they were the first of mankind to cross wide seas. On the contrary, he declaimed, his people originated with Dream Time creation beings in Arnhem Land itself, and there were surviving natural features from those events to prove it. Many arid land elders produce secret 'maps' of concentric circles and lines which authenticate their tribal lands and establish that man originated in Central Australia. Ancestors then moved out in all directions, along migration routes so well established that ritual acts are performed still at key places along those routes. These are eternal verities, beyond the probing trowel, statistics or laboratory analysis.

Some leaders are aware of the great diversity of Aboriginal culture between different traditionally oriented groups and between detribalised urban and rural part-Aborigines, who seek an Aboriginal identity. Diversity is a cultural strength, but at present it is a great political weakness. Some leaders therefore realise that education in prehistory for all Aborigines could foster better mutual understanding and pride in achievement. This is one appeal of a national Gallery of Aboriginal Australia, where visitors of any race could be educated in the diversity of Aboriginal ways and achievements in time and place.

There has been hostile opposition to the excavation of sites deemed 'sacred', including burial grounds, and to museum displays. Much vocal protest comes from urban Aborigines who, themselves lacking vibrant traditions, seek to create them, using American Indians as a model for political protest. Yet it is evident that archaeologists hitherto dug sites in ignorance of Aboriginal wishes, and that Museums displayed items never intended by their owners for the public gaze, or exhibited skeletons in tasteless and ghoulish manner. Aboriginal culture has been treated as a human zoo. Most prehistorians and museologists now comprehend that a positive dialogue, involving the feedback of

results from fieldwork to the Aboriginal community or the production of suitable educational texts or sensitive museum exhibits, can make academic research meaningful. In facilitating mutual understanding, the Australian Institute of Aboriginal Studies and the Australia Council, Aboriginal Arts Board, are playing vital roles. Archaeologists themselves are making positive contributions by involving Aborigines closely in their work, by voluntarily ignoring sites of great potential because grave offence would be given by working there, and by working closely with museologists in reformulating exhibition and storage procedures. Some authors have excluded certain illustrations from general books likely to reach Aboriginal readers and cause grave offence, and they have supplied copies to communities amongst whom they have worked. Unfortunately, the media remains largely insensitive towards these issues and retains a ghoulish fascination for Aboriginal bones. It has not aided the cause of racial mutual respect.

From the *Dawn of European Civilization* until *The Prehistory of European Society,* Gordon Childe strove to make the past meaningful to Europeans.[9] Since his death a fully global approach to world prehistory has emerged, and Australia's contribution to that perspective is an important one. However, Childe's concept of pattern and purpose on a continental scale, and his attempts to inform the public of that continent at both scholarly and popular levels, has application to Australia. In addition to fulfilling the expectations of scholars overseas with pragmatic field data for testing hypotheses, ethnographic analogies and behavioural models, Australian prehistory must be made meaningful to both Aboriginal and new Australians.

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[9] Childe's own meagre use of ethnographic data in general and of Australia in particular, together with his ambivalent attitude to such sources, merits closer investigation. This theme has been opened in perceptive fashion by P. Gathercole (1971). Childe probably had little experience of Aborigines. He did not refer to Aborigines in *How Labour Governs*, but that is not surprising in the circumstances of politics then. He was mildly cynical about the White Australia Policy, one of the Labour Party platform planks of his day, but evidently accepted its economic basis, if not its racist overtones (1964 edn, pp. 72, 80). He did not attend the major Congress of the Australian Association for the Advancement of Science in January 1921. Had he done so, he would have heard the Presidential Address by Sir Baldwin Spencer, who used the term 'savage' in the manner of Childe's exemplar, Lewis H. Morgan.

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Rescue Archaeology in Sussex, 1977
A Fourth Progress Report on the Sussex Archaeological Field Unit

By

Peter Drewett (Ed.), Owen Bedwin, David Freke and David Rudling

Introduction (Fig. 1)

During 1977 the Sussex Archaeological Field Unit continued its policy of rescue archaeology operating within four main research projects as outlined in the third progress report (Drewett, 1977). During the year, however, it was decided to extend the Origin of Sussex Towns project to consider pottery kiln sites. As the majority of archaeological data recovered from towns rests on pottery for its dating, it was considered essential to establish a firmer sequence of pottery than currently available. This extended project has begun with the excavation of the first 16th century kiln site to be discovered in the High Weald. The site was discovered while being destroyed by ploughing. The threat of plough damage continued to be the major reason for rescue excavations (Bullock Down, Black

Fig. 1 Projects undertaken by the Sussex Archaeological Field Unit, 1977. 1, Bullock Down Neolithic site; 2, Black Patch; 3, Bullock Down Bronze Age burials; 4, Bullock Down Romano-British farmstead; 5, Bullock Down Medieval settlement; 6, Steyning; 7, Seaford; 8, Hartfield kiln; 9, Harting Beacon; 10, Chanctonbury Ring.

Patch and Harting Beacon), while small-scale development in towns necessitated rescue work in Steyning and Seaford.

NEOLITHIC AND BRONZE AGE SETTLEMENTS AND THEIR TERRITORIES

I. The Excavation of a Neolithic Open Settlement on Bullock Down, Beachy Head, East Sussex

by P. L. DREWETT

The excavation of the Neolithic settlement area on Bullock Down began in 1976 (Drewett, 1977: 9), was continued during 1977. A further 154 m^2 were excavated by hand on a 1m grid, the exact position of each flint and potsherd being recorded. The main area excavated was in square 27 (see Fig. 5 in Drewett, 1977). The majority of the flintwork and pottery was found at the base of the modern plough soil. The highest concentration of pottery was found in Trench F1 (Fig. 2) but once again no features were located. It is unlikely that features were missed, as the whole area excavated was crossed by undisturbed stone stripes of periglacial origin. It is becoming clear, however, that discrete activity areas marked by concentrations of flint waste (e.g. Drewett, 1977; Fig. 6) or pottery (Fig. 2) are being located. Although the material is plough scattered and the areas themselves lowered by erosion, the relationship between them appears to survive. The activities indicated by the artifact concentrations may have taken place in the open air but the pottery concentration could indicate the site of a structure built in such a way as to leave no archaeological trace.

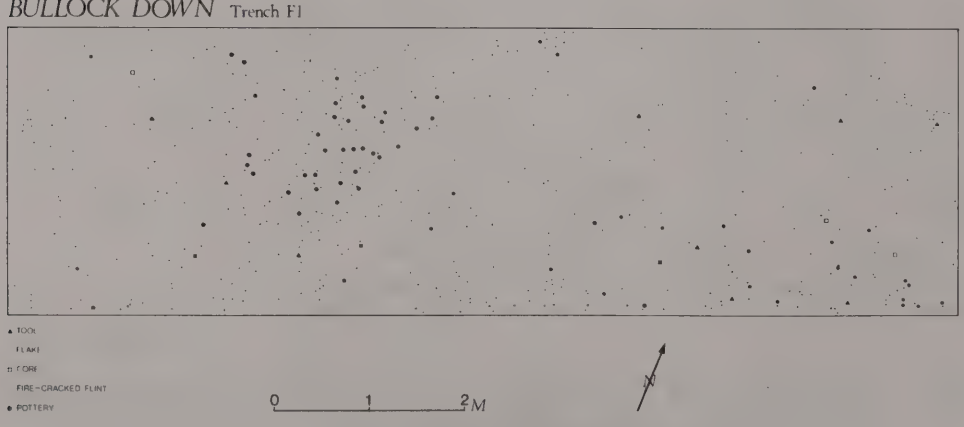

Fig. 2. Bullock Down, 1977. Plan of Trench F1.

II. The Excavation of a Bronze Age Settlement at Black Patch, Alciston, East Sussex

by P. L. DREWETT

The Bronze Age settlement at Black Patch, Alciston, was discovered by Mr G. Hollyman and surveyed by Mr E. Holden for Curwen's *Archaeology of Sussex* (Curwen, 1954: 192–3). Unfortunately, since the publication of that plan, the site has been levelled

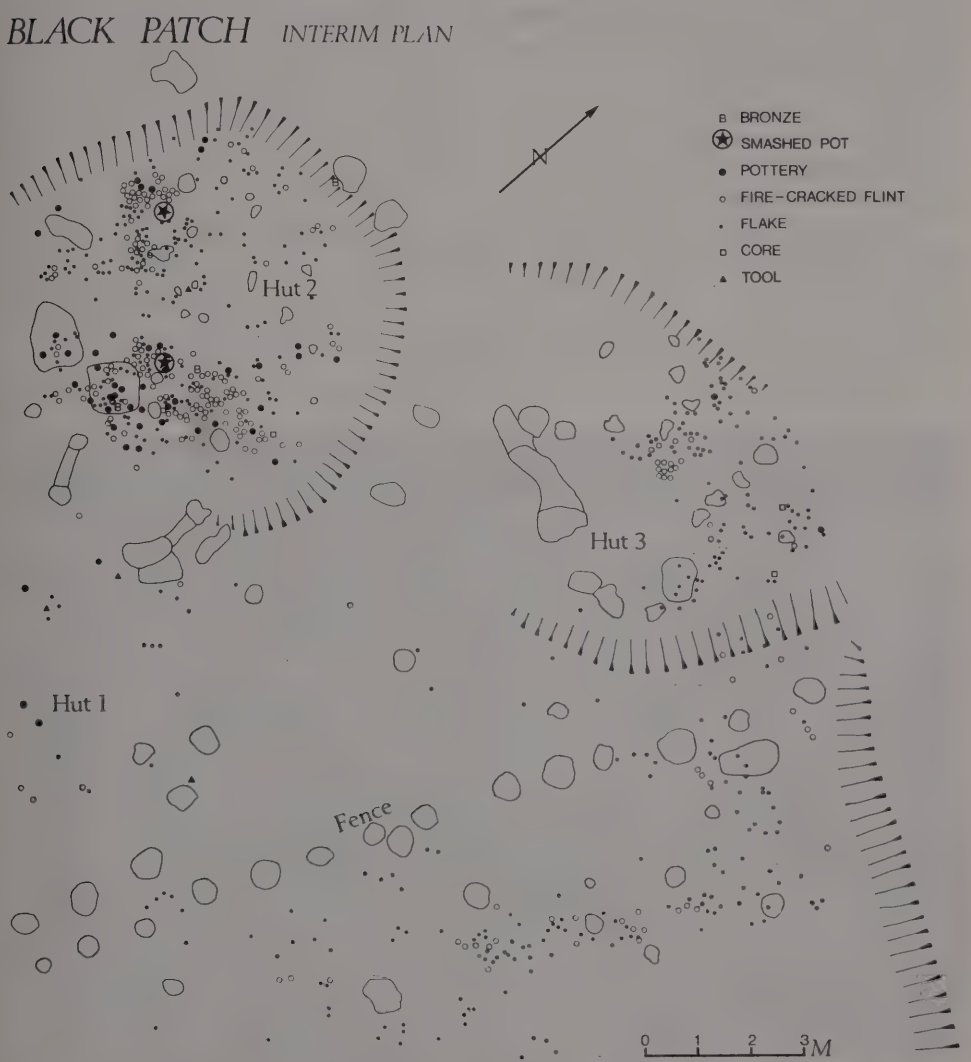

Fig. 3 Black Patch, 1977. Interim plan of area excavated. Post-holes in outline. Some artifacts have been omitted within the major clusters for the sake of clarity.

by ploughing. A trial excavation was therefore undertaken in 1977 both to confirm the suspected date of the site, and to establish whether, in the light of plough damage, it warranted a major excavation in 1978. The site consisted of some 16 enclosures and house platforms set in a complex of rectangular fields. One house platform, located from Mr Holden's plan, was totally excavated in 1977 (Fig. 3).

The structures on the northern side of the platform were found to be well preserved under bank material recently bulldozed into the hut hollows. Three hut structures of two phases were located underlining the multi-phase nature of the Sussex Middle Bronze Age settlements, as recently suggested by Ann Ellison at Itford Hill (Ellison in Drewett, 1978). Slightly under half of hut 1 was excavated. It consisted of an arc of post-holes indicating a circular structure some 8.5 m in diameter. Terracing for hut 2 probably removed some post-holes on the northern side, together with the occupation debris. A few potsherds, flint flakes and fire-cracked flints were all that survived within the area of the structure excavated.

Hut 2 was the main hut excavated (Plate I). The hut was constructed on a terrace cut level into the hill slope. A circle of post-holes 5 m in diameter indicated uprights probably supporting roof timbers which rested in post-holes on the outer end of the terrace, thus giving a floor area some 8 m in diameter. The distribution of fire-cracked flints on the hut floor indicated two possible hearth areas each associated with a single,

Plate I Black Patch, 1977. Hut 2 from the south-east. Scale 2 m. (Photo P. L. Drewett.)

smashed pot (Fig. 3). A general scatter of flint flakes over the hut floor possibly indicates the use of flakes rather than regular flint knapping within the hut. A loom weight and fragments of others (not shown on Fig. 3), together with quern fragments indicate other activities which may have taken place within the hut. A bronze awl and blade were also found (B on Fig. 3).

Hut 3 was probably an ancillary building associated with hut 2. The artifact distribution within the hut offered little information concerning activities practised within it, although a small concentration of fire-cracked flints perhaps indicates a hearth, unless they were collected for some other purpose such as for use as filler in pottery. To the east of the three huts a fence line (Fig. 3) perhaps marked the limit of this complex. Outside the fence were a number of post-holes and a scatter of flint flakes and fire-cracked flints.

The type and arrangement of the huts, together with the artifact assemblage, and particularly the pottery, has close parallels with Itford Hill. Itford Hill has a single C-14 date of 1,000 ± 35 bc. A similar Middle Bronze Age date appears likely for Black Patch. It is hoped to continue the excavation of the settlement site, together with associated field systems and barrows, in 1978.

BULLOCK DOWN MULTIPERIOD SETTLEMENT PROJECT

III. The Excavation of Bronze Age Burials on Long Down, Bullock Down, East Sussex

by P. L. DREWETT

In 1976 Mr E. Williams found an almost complete collared urn in a rabbit hole on Long Down (TV 5742 9666) and noted human bones being thrown out of rabbit holes some 150 m to the north-east. The collared urn belongs to the secondary series and displays in its bi-partite form and use of vertical cord lines on the collar typical features of the south-eastern style (I. Longworth, pers. comm.). The area around the urn was excavated in 1977, but the slight bank in which it appeared to be set proved to be a residual line of clay-with-flints resulting from ploughing on its north and south sides, probably in the Romano-British period. Immediately to the north of the pot was a shallow pit containing a cremation. It is possible that the burial was in a ditchless barrow, but if so, all trace of it was removed by Romano-British agriculture.

Some 150 m north-east of the collared urn the remains of two crouched burials were excavated. Both were badly disturbed by rabbit burrowing. Unfortunately, no associated artifacts were found, but as one of the burials was overlain by a large number of struck flakes, a Bronze Age date (or earlier) appears probable.

IV. The Preliminary Excavation of a Romano-British Settlement Site on Frost Hill, Beachy Head

by D. R. RUDLING

An exploratory excavation was undertaken of one of the two known Romano-British settlement sites on Bullock Down (TV 572 960).

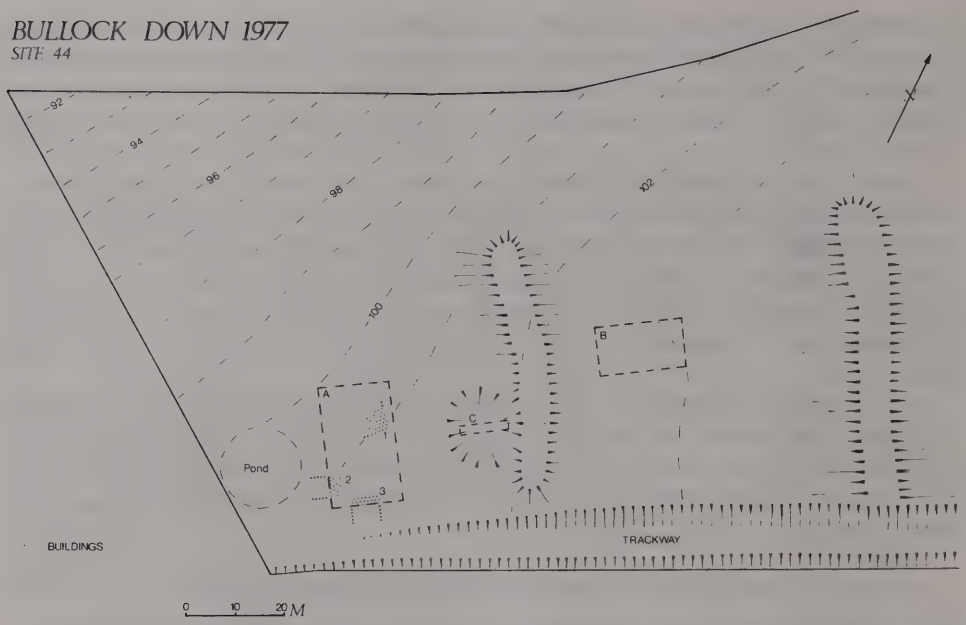

Fig. 4 Bullock Down, 1977. Preliminary excavations of the Romano-British Farmstead in relation to field banks and the double lynchet trackway.

Three trenches were dug, one 25 m x 15 m, one 18 x 10 m and the other 10 m x 2 m (Fig. 4). The two larger trenches were sited with regard to the results of field walking carried out during the previous winter. This survey work had shown that certain 'black patches' visible in the field, yielded very high densities of pottery and building material, and it was considered possible that these areas might be the location of house platforms. Unfortunately, excavation proved this not to be so, in both cases the 'black patches' being natural pockets of clay-with-flint and devoid of any recognisable archaeological feature.

In Trench A the areas of exposed chalk surrounding the pocket of clay-with-flint did yield significant archaeological remains and these include two lines of post-holes that are interpreted as being fence lines, and traces of three structures. Although the post-holes in the fence lines were of regular spacing, they varied considerably in size, shape and packing material. While very few sherds or artifacts were recovered from the fills of the post-holes, a fairly large sample of carbonised grain was obtained using the flotation technique. Mr Chris Green has kindly made an initial examination of the pottery obtained from the post-holes and has suggested that the sherds from fence line 1 belong to the late Roman Period, while those from fence line 2 are earlier and include an example of Iron Age date. It must be remembered, however, that we are dealing here with only a few small sherds and that therefore their value as dating material for the fence lines is very limited.

Plate II Bullock Down, 1977. Frost Hill Romano-British settlement. Structure 1 from the west. Scale 2 m. (Photo D. Rudling.)

Structure 1 consisted of the south-east corner of a rectangular timber building, which appears to have been constructed on the basis of timber verticals with horizontal sill beams between to take the wattle infilling (Plate II). The few pieces of pottery associated with this structure belong to the first half of the Roman period, but are again of limited value for dating purposes. A small pit was discovered with the area enclosed by this structure but, owing to its almost barren fill, its function, dating and relationship to the building remain uncertain.

Structure 2 was also the corner of one of these timber buildings. It is interesting to note that its eastern wall runs adjacent to and parallel with one of the fence lines mentioned earlier. It is thus possible that these fence lines represent the boundaries of compounds containing one or more rectangular buildings.

The third structure discovered in Trench A consisted of an isolated length of beam-slot.

On the basis of the evidence obtained from this year's excavation, it is as yet impossible to specify the function of the three timber buildings discovered in Trench A, and although it is tempting to view them as habitation huts, the possibility remains that they could have been used for some other purpose such as for the sheltering of farm animals.

As in the case of Trench A, Trench B was machine excavated down to the underlying chalk, but despite a general scatter of Romano-British pottery in the plough soil, the trench unfortunately yielded no structure or post-holes dating to the Roman period.

The final trench was positioned in the centre of a depression that lies between Trenches A and B and it was hoped that, on account of the protection offered to this area by the lynchet that forms the eastern edge of this depression, the area tested would prove to have suffered less destruction from ploughing than had been the case with the other two trenches. This hope proved well founded, and in the southern half of the trench was a layer of soil and fragmented chalk containing comparatively large quantities of less abraded refuse material. Four post-holes and part of a much larger feature were found cut into the natural chalk. Unfortunately, shortage of time restricted us to excavating only part of the larger feature discovered in this trench. What was excavated, however, proved to be the rounded end of a feature that appears to continue westwards beyond the limits of this year's test trench. The finds included several large pieces of stone foreign to the site, especially Greensand, and most of these showed signs of burning. It is thought possible that what has been excavated so far may be the end of a stoke hole of a corn drying oven.

In 1978 it is planned to follow up the results of this summer's excavation by opening up a much larger area of Frost Hill, with the aim of obtaining a more meaningful settlement plan and site history.

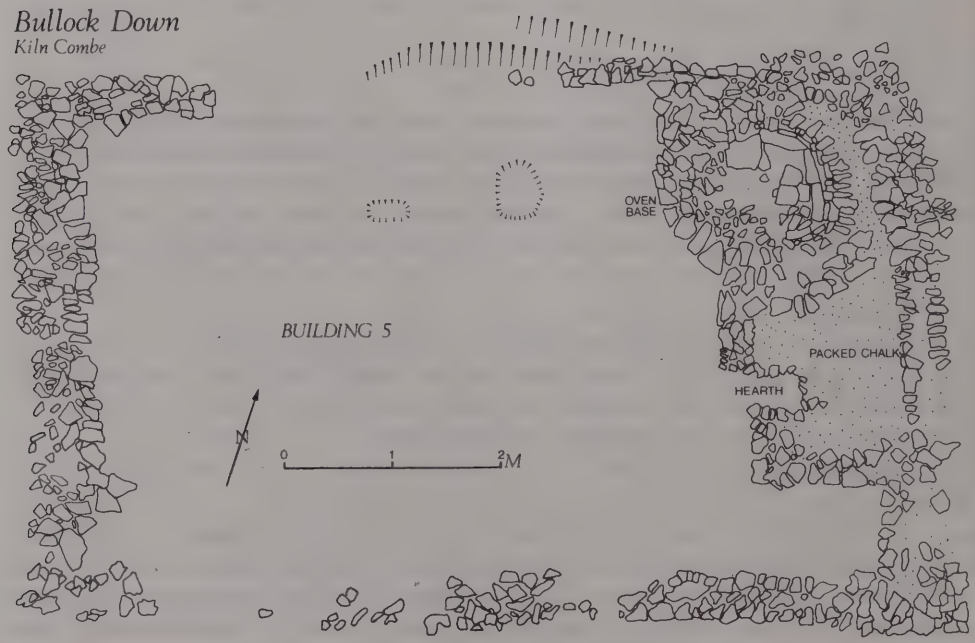

Fig. 5 Bullock Down, 1977. Plan of medieval building 5.

V. The Excavation of a Medieval Farmstead at Kiln Combe, Bullock Down, East Sussex

by P. L. DREWETT

The preliminary excavation of the badly plough damaged southern end of the northern house platform at Kiln Combe in 1976 (Drewett, 1977: Fig. 10) was followed up by the total excavation of the platform in 1977. The main farmhouse was found situated in the northern corner of the platform. Around this building were the four outbuildings partly excavated in 1976.

The main building (Fig. 5) consisted of a rectangular flint footed structure some 8 m x 5 m. Much of the central area, together with the northern wall had been removed by flint diggers earlier this century. However, the footings at the west and east ends of the building were well preserved (Plate III). At the east end was a substantial base of a bread oven with a hearth to the south. Adjacent to the oven base was the shattered remains of a Mayen lava quernstone. Immediately behind the house, on the northern side, was a large pit of the type frequently found behind the houses at Wharram Percy and interpreted there as quarries dug to obtain chalk for building (Beresford and Hurst, 1971: 116). To the south and west of the farmhouse were two rectangular buildings, partly excavated in 1976 (Drewett, 1977: Fig. 10), which may be interpreted as a barn and a byre, although the northern structure may have been a second house. The floors of these were fairly level

Plate III Bullock Down, 1977. Kiln Combe medieval settlement. Building 5 from the south. Scale 2 m. (Photo P. L. Drewett.)

compared with the strikingly dished floors of the other two outbuildings, which may be interpreted as pigsties (Drewett, 1977: Fig. 11).

We can therefore interpret this farm in its final phase, perhaps in the mid-15th century, as consisting of a substantial farmhouse, a large barn, a byre and either a shed and a pigsty, or possibly two pigsties. Associated ridge and furrow fields, together with grain found by flotation during the excavation, indicate arable farming. Animal husbandry was indicated by the presence of sheep, cattle and pig bones, together with a spindle whorl, indicating the spinning of wool. The gathering of shellfish, particularly limpets but also oysters and whelks, supplemented the diet probably of both the inhabitants and their animals.

Imported mica-schist whetstones and Mayen lava quernstones, together with bronze buckles, part of a bronze bowl, a lace end, iron arrowheads, and a key all indicate a reasonable standard of living.

Further evidence of earlier occupation on the site, back to the 13th century was located, but the large-scale movement of chalk required for the terracing of building 5 (Fig. 5) has clearly removed most of the earlier structures.

THE ORIGIN OF SUSSEX TOWNS

VI. Excavations in Tanyard Lane, Steyning, West Sussex

by D. J. FREKE

In February and March 1977 an area west of Steyning parish church was excavated prior to redevelopment. Previous excavations in 1962–3 (unpublished) and 1967–8 (Evans, 1968) to the south and south-west of the church produced evidence for late Saxon urban occupation, which compared well with documentary and numismatic sources (Dolley, 1961). Steyning's mint dates from 1016.

The site, on a gentle north-facing slope, was visibly terraced. The terraces proved to be the result of post medieval horticultural works (Fig. 6). The earliest artifacts on the site were a few fragments of Roman pottery and tile in medieval contexts. The Roman Greensand Way passes about 2 km north of Steyning. There were many features of late Saxon and medieval date (Fig. 7). Pottery was used to date them, but as very few diagnostic sherds were present in many of the samples, a sherd count based on fabric types was undertaken. The groups with larger proportions of coarsely filled fabrics were considered to be earlier than those with large proportions of finer fabrics (Barton, 1972). The pits and post-holes do not conform to any coherent pattern. One complex of pits produced quantities of burnt stone and bloomery slag associated with late Saxon pottery. This is perhaps an indication of local iron working on the outskirts of the late Saxon town. A roughly 'cobbled' area to the south produced a bun-shaped loomweight, a pair of iron shears and fragments of quernstone and whetstone. The area seems to have been in use as a yard in the 12th century. Late medieval drainage ditches, one recut, cross the northern part of the site.

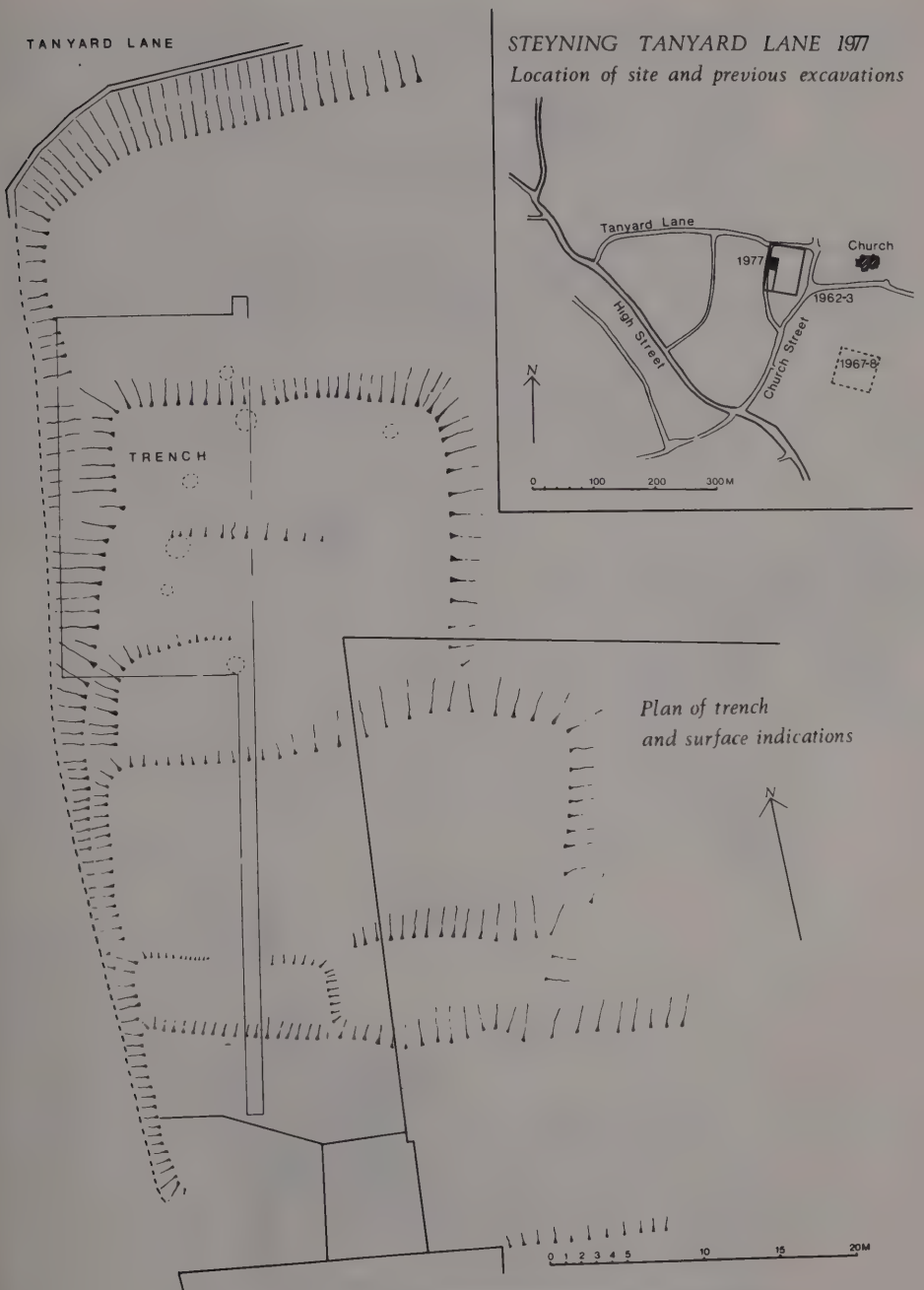

Fig. 6 Steyning, 1977. Location map and plan of earthworks.

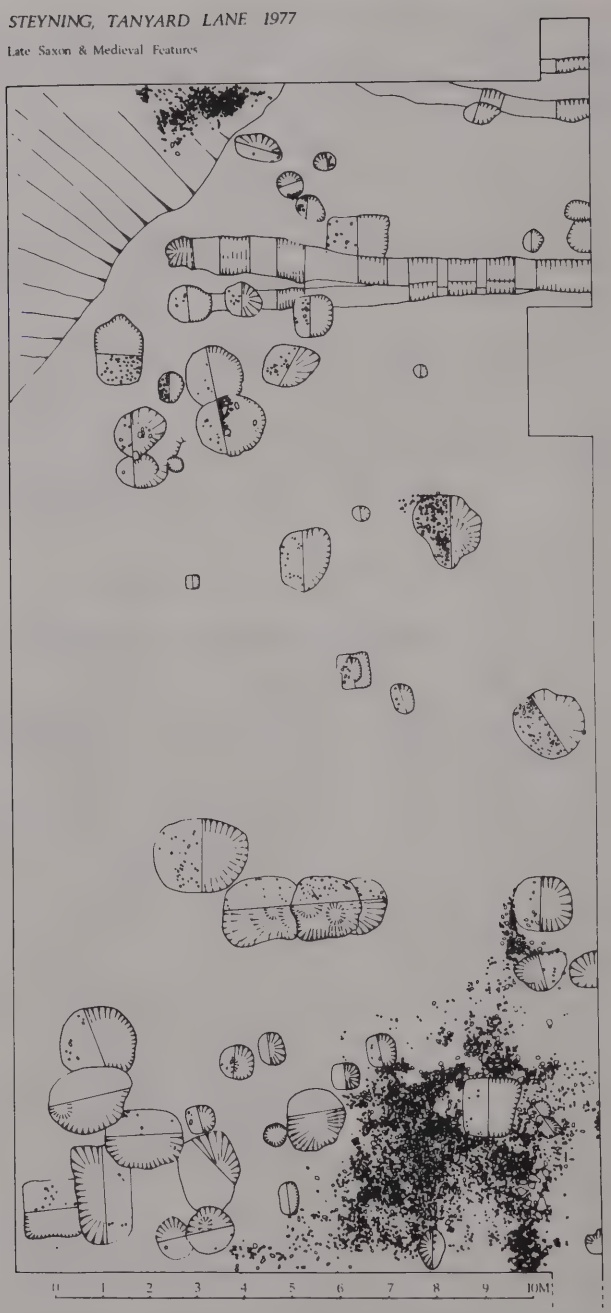

Fig. 7 Steyning, 1977. Late Saxon and medieval features.

None of the features is post-medieval, and documentary evidence suggests that the area became gardens in the mid-15th century (Hudson, pers. comm.).

VIII. Excavations in Steyne Road, Seaford, East Sussex

by D. J. FREKE

Seaford's medieval history is linked to its position on the banks of the Ouse, which used to debouch under Seaford Head (Aldsworth and Freke, 1976: 54–5). Steyne Road runs at the foot of the slight rise on which the town now stands (Fig. 8) and was assumed to mark the medieval north bank of the Ouse. Two small trenches were excavated on land due for redevelopment in Steyne Road to check this assumption.

The northerly trench (Fig. 8) revealed a medieval gravel floor, a beam-slot and a chalk-and-flint lined well. Thirteenth or 14th century material was found built into the top of the lining. The southerly trench produced medieval pottery from a gully which

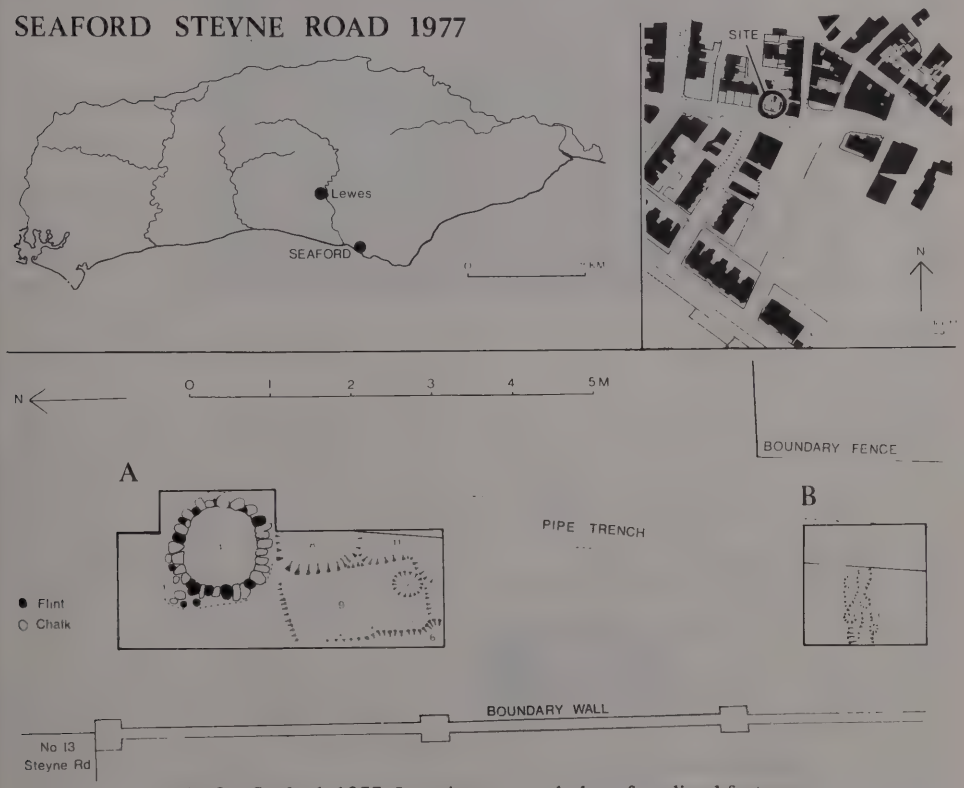

Fig. 8 Seaford, 1977. Location map and plan of medieval features.

probably held a fence. Later features included a post-medieval chalk wall and almost a metre of recently made up ground.

The evidence, particularly the well, suggests that the site was not on the medieval bank of the tidal Ouse. The explanation for this may be as follows. Seaford Head is the limiting factor for the seaward extent of the shingle bank behind which the Ouse was contained, but this headland has eroded landward to some extent since medieval times and consequently the shingle bank must have migrated inland by a similar amount. The cut at Newhaven in 1539 diverted the river, but the town of Seaford has none the less suffered repeated floods, which may have altered the configuration of the old river bed. The excavated evidence tends to support the suggestion that the landward drift of the shingle has been accompanied by erosion of the old Ouse bed and there may have been some destruction of the medieval town site in the post-medieval period. The present day street alignments may reflect such a truncation, as none of the older streets is either parallel, or perpendicular, to the presumed line of the old river bank where one would expect wharves and other harbour facilities. Seaford's history and layout should be compared with other Sussex coastal towns, particularly New Shoreham, Brighton, Hastings and Pevensey.

VIII. The Excavation of a 16th Century Kiln at Lower Parrock, Hartfield, East Sussex

by D. J. FREKE

In 1976 the waster heap of a 16th century kiln was noticed by Mr N. Braden in a newly ploughed field near Lower Parrock. Mr C. F. Tebbutt established the extent of the wasters by field walking, and as the site was due to be ploughed again, it was totally excavated in September and October 1977. The kiln and its waster heap were excavated

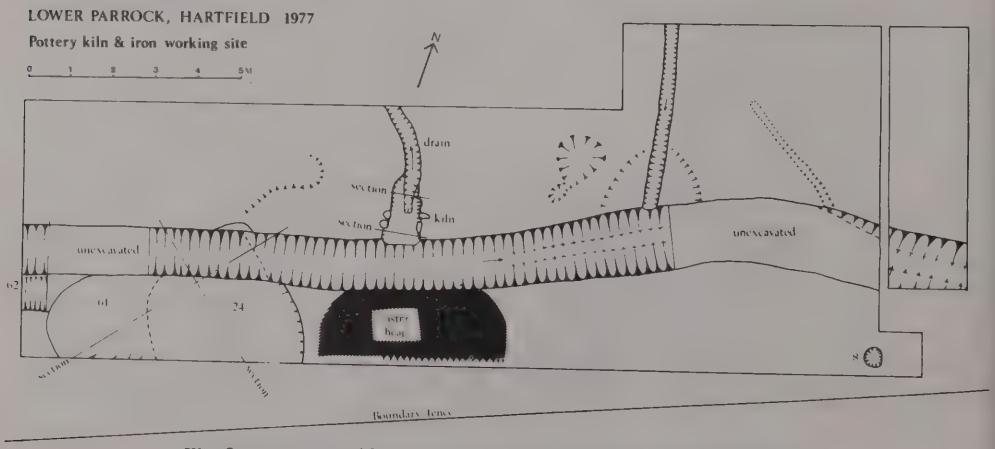

Fig. 9 Hartfield, 1977. Plan of pottery kiln and iron working site.

Plate IV Hartfield, 1977. 16th century pottery kiln. Vertical scale 2 m, horizontal scale 50 cm. (Photo D. J. Freke.)

in 2 m squares with an almost complete recovery of the pottery. The kiln was dug 15–20 cm into the natural clay and had been refloored at original ground level (Fig. 9, Plate V). The second phase had been drained by a gully filled with wasters (Plates V and VI), and the refloorings may have been necessitated by drainage problems, as at Pottersbury (Mayes, 1968). The southern end of the kiln had been removed by a later ditch (Plate IV), but the position of the waster heap seems to rule out a second flue at this end. There were no internal divisions.

A large pit which continued outside the excavated area (feature 24) may have been dug to provide clay for the kiln superstructure, as the alluvial clay in the immediate vicinity is not suitable for thrown pots (Nuttgens, pers. comm.). The pit was filled with layers of burnt clay, fine grey clay and hundreds of wasters, many of which were complete enough to reconstruct. The forms produced on the site include mugs, jugs, pitchers, storage jars, cooking pots, bung-hole jars, pannikins, shallow bowls, plates, chafing dishes,

costrels, sieves (colanders?), candlesticks, crucibles and elaborately pierced and spouted roof furniture. A proportion of the vessels were lead glazed. Some fragments of finer pottery made on the site were also found, decorated with fine, moulded renaissance masks and swags. A very simple incised pattern was used on the coarse wares, but very few examples of either form of decoration were found.

The nearby Parrock furnace, dated between 1500 and 1600, was in operation throughout the life of the kiln and slag was found in all contexts. There was also subsidiary iron working debris in the area of our trench, intensifying toward the north-east, where much slag and charcoal was found. It was delimited by the ditch which may have provided a water supply for the process. The ditch was recut in the eastern half of the trench. The number of German stoneware and French earthenware fragments increased towards the north-east of the site and thus these may relate to the later iron-working rather than the kiln.

Plate V Hartfield, 1977. Waster filled gully draining from second phase of kiln. Scale 2 m. (Photo D. J. Freke.)

Plate VI Hartfield, 1977. Wasters used as drain in gully draining kiln. Scale 50 cm. (Photo D. J. Freke.)

A near complete sherd recovery technique was used except in the case of the pit 24, where half was near completely recovered and the other half sampled. It is hoped that this very large sample will provide accurate proportions of forms, faults, glazes, etc., for comparison with completely excavated kilns elsewhere.

The proximity of the contemporary iron works and the use of the site as a secondary iron working area after the demise of the kiln suggests that they were associated in some way. An interesting possibility is suggested by the presence of 38 French technicians and labourers in Hartfield in 1524 (Cornwall, 1976).

PRE-ROMAN IRON AGE SETTLEMENT IN RELATION TO ECONOMY AND ENVIRONMENT

IX. Excavations at Harting Beacon Hill Fort, West Sussex

by O. R. BEDWIN

Harting Beacon is a large, univallate hill fort which has had most of its interior ploughed for several years. Fieldwalking indicated a faint scatter of pottery on the

eastern side of the hill fort, with a slightly greater concentration in the south-east corner. During the first season's work on this site in 1976, two areas were excavated (Bedwin, 1977). One of these, Area I, *c.* 40 m x 30 m, was just inside the southern rampart in the south-east corner of the enclosure. Four four-post-hole structures were found, plus three pits, and some other post-holes. A section was put through the ditch and rampart (Area II). In 1977, two more areas were excavated; Area III, 30 m x 15 m, was adjacent to the northern edge of Area I. Its purpose was to trace the extent of the four-post-hole structures. Area IV, 14 m x 10 m, was dug to investigate the western entrance.

In Area III the ploughsoil was removed by machine, the chalk beneath was then cleaned and the features cut into it excavated. Only a single shallow pit, containing a few

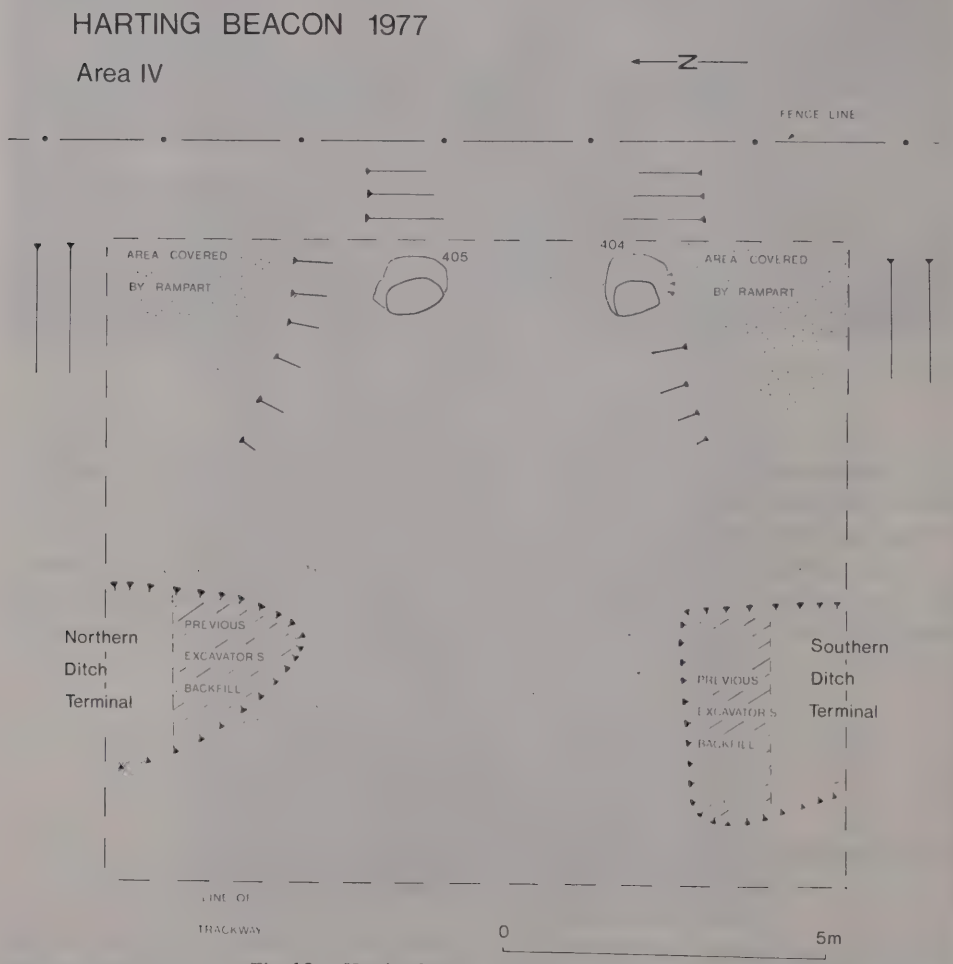

Fig. 10 Harting Beacon, 1977. Plan of Area IV.

sherds of early Iron Age pottery, and an undated post-hole were found. This suggests that most of the surviving features are nucleated in the south-east corner, just inside the rampart.

The western entrance (Area IV) consists simply of a gap in the bank and ditch which form the western edge of the hill fort. Four features were revealed (Fig. 10); there were the two ditch terminals, of rather dissimilar shapes, and two large entrance post-holes. Both terminals had been disturbed by a previous excavator (Keef, 1953). Undisturbed ditch silts within the excavated area did show a clear re-cut in both terminals, but pottery from the initial silting, and from the re-cut, all belonged to the early Iron Age. There was no evidence of re-cutting the terminals in the late Iron Age or Roman period (Keef, 1953). In the silt within the re-cut in the southern terminal, an isolated human skull, lacking only the mandible, was found. This will be used to obtain a C-14 date.

Both entrance post-holes had been filled with domestic debris. The southern post-hole, in particular, contained several large fragments of saddle quern, considerable amounts of charcoal, and some early Iron Age pottery.

X. Excavations at Chanctonbury Ring, West Sussex

by O. R. BEDWIN

This hill fort is situated on top of the scarp slope of the South Downs, about two miles north of Cissbury. The univallate earthwork encloses 3 acres (1¼ hectares), and has a single, simple entrance to the east (Fig. 11). The position of the hill fort is unusual in that it is situated not on a well-defined hilltop, but on the highest point of a broad ridge, which runs east–west. Thus the approaches to the hill fort from east and west are almost flat. Two cross dykes are symmetrically placed across this broad ridge, each one about 200 m from the hill fort.

The three areas scheduled for tree re-planting were excavated (Fig. 11, Areas A, B and C). These were well separated and provide a good random sample within the hill fort. Sections were also dug through the rampart and ditch (Area D), and through the western cross dyke, in an attempt to compare the date of these earthworks. Finally, two small, exploratory trenches (Areas F and G) were excavated. The findings from each of these areas will now be considered in turn.

At the eastern end (Area A, near the temple), considerable amounts of building rubble were found, including large flint nodules, mortar, *opus signinum*, and painted wall plaster. This material, which contained a little Romano-British pottery, was derived either from the decay or the demolition of the temple (Mitchell, 1910). Beneath the rubble was a continuous layer made up largely of oyster shells, again with a little Romano-British pottery. This layer was almost certainly deposited during the period when the temple was in use, and may well be connected with ritual practised there. Little else was found in Area A; two post-holes of unknown date, and several slit trenches or shallower depressions, dating from the Second World War.

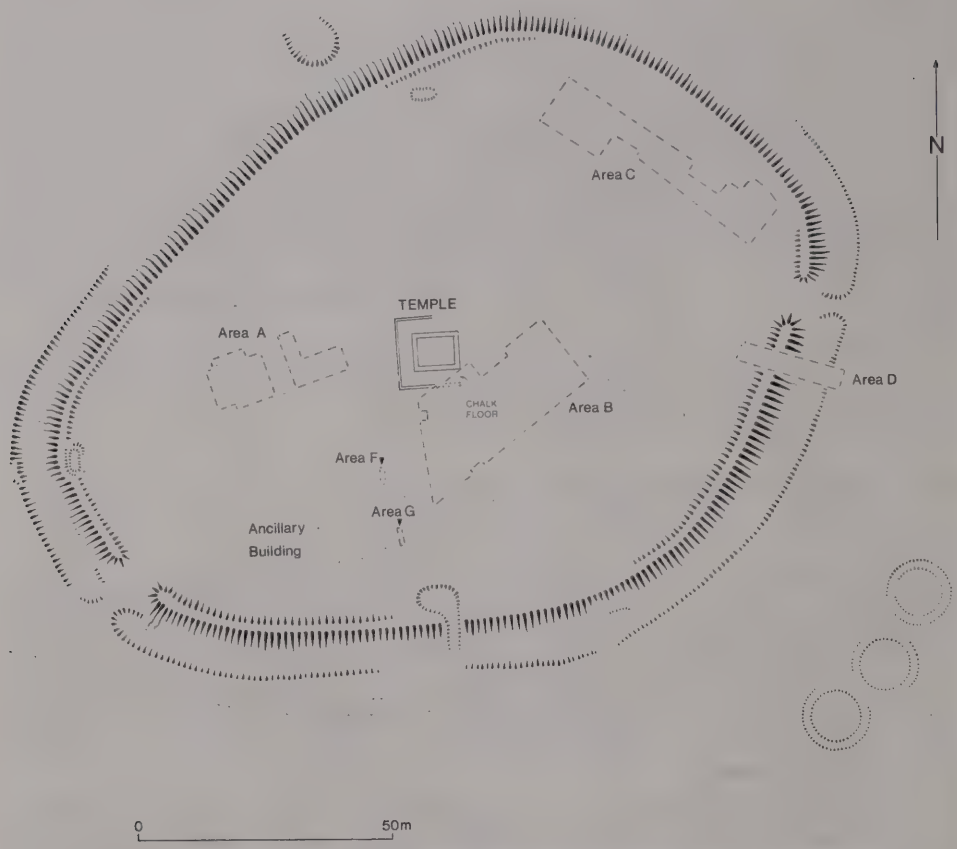

Fig. 11 Chanctonbury Ring, 1977. General site plan (from survey by F. G. Aldsworth).

Again, in Area B (Fig. 12), few features were present; in the north-west corner, an area of hard-packed chalk floor was found, just outside the southern edge of the temple. No masonry belonging to the temple was found. All other features were shallow pits or depressions. The irregular pit, feature 110, was the only Iron Age feature found in Area B. It contained some early Iron Age pottery, animal bones, and charcoal. In feature 111, another irregular depression, *c.* 3,000 tesserae were found, the majority being white, with a few dark reddish brown.

The topsoil yielded a wide variety of artifacts. There were several flint implements, including a polished flint axe, arrowhead, and laurel leaf (all Neolithic), and five scrapers of either Neolithic or Bronze Age type (Drewett, pers. comm.). Large amounts of

Fig. 12 Chanctonbury Ring, 1977. Plan of Area B.

Romano-British pottery were found, especially around the chalk floor. Many of the sherds were clearly derived from small vessels, presumably used in ritual carried out at the temple. One ritual vessel, about 10 cm high, was found intact in a very small pit, feature 116 (Fig. 12). Several Roman bronze coins were found in the topsoil, plus a Roman bronze fibula, part of a bronze ingot, and fragments of bronze dagger blades. There were also a few sherds of 14th/15th century wares, a post-medieval gun flint, and some tradesman's tokens of the later 18th century.

Area C, *c.* 65 m long, just inside the rampart on the north-east side of the hill fort, was almost completely barren. Three post-holes, one of which may belong to the early Iron Age, were all that was found.

A 4 m wide section was cut through the rampart and ditch just to the south of the entrance (Area D, Figs. 11 and 13). Finds from the ditch were plotted on a running section as excavation proceeded. Although it is unwise to base too much on the results from a single section, dateable finds from the ditch do suggest a straightforward sequence of events. In layer 5 were a few scraps of early Iron Age pottery. Above this, layer 4 was sterile, and then in layers 2 and 3 were considerable amounts of Romano-British pottery and large numbers of animal bones. The implications of this sequence are that the hill fort was constructed at the beginning of the Iron Age; after a short period of use, it was abandoned (hence the sterile silt). It was then re-used, as a ritual site in the Roman period. There was no sign of a re-cut in this section of the ditch.

The rampart was revealed as simply a bank of mixed chalk and clay-with-flints rubble. At some stage after the building of the original rampart, a substantial wall of rough chalk lumps (layer 15) was added at the back. Nothing was found to date the construction of this wall; it cannot really be considered of defensive significance as it is on the inside of the hill fort, and it may therefore be associated with the use of the site as a temple enclosure in the Roman period.

The western cross dyke (Area E), the more prominent of the two, consisted of a single parallel ditch and bank. A 2 m wide section was cut through it; the bank was shown to be a simple dump, consisting of upcast from the ditch. The ditch deposits suggested straightforward silting, with no re-cutting. The date of this earthwork is problematical; the only pottery recovered was a single body sherd from the base of the bank. Its fabric

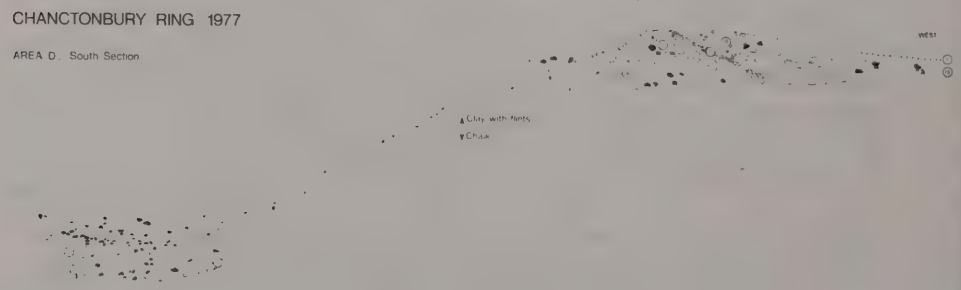

Fig. 13 Chanctonbury Ring, 1977. Area D; South Section.

is unquestionably Romano-British, and so the cross dyke may be Roman, though it could, of course, be later. Either way, this is most unusual, if not unique.

During the excavation of Areas A–E, Mr B. A. French, a local resident, visited the site and described the finding, in 1946 of a tessellated pavement, first noticed in the side of an army slit trench. Since this discovery had never been made public, it was decided to excavate a small trial trench (Area F) to establish the position of this floor. A limited area of the floor was duly uncovered, lying towards the southern end of Area F; it consisted of roughly shaped sandstone cubes, *c.* 3 cm side, resting on hard-packed earth.

The purpose of the final trench (Area E) was to check the location of the structure referred to in Fig. 11 as the 'ancillary building', originally called 'the shrine' (Mitchell, 1910). Accordingly, a trench 5 m × 1 m was dug across the eastern end of the building, but no structure was found; furthermore, there was no sign of artifacts or building rubble. The existence of this building is therefore in some doubt.

Conclusions

The hilltop at Chanctonbury was first used during the Neolithic period, as indicated by the flintwork found in Area B, though there is no suggestion of a settlement at that time.

The univallate hill fort was built in the early Iron Age; the pottery assemblage closely resembles that of Hollingbury and Harting Beacon. The function of the hill fort remains enigmatic; approximately 10% of the interior was excavated in three well separated areas. The finding of only one shallow pit, and a single post-hole of Iron Age date makes it unlikely that there was ever a settlement. Alternatively, the site could have been a stock enclosure or a ritual centre, but the evidence from the 1977 excavation is so meagre as to make a choice between these two almost impossible. What cannot be denied is that the hill fort was abandoned, perhaps towards the end of the 5th century BC. It was then re-used as a ritual site in the Roman period, from the 1st century to the 4th, and was again abandoned until the tree-planting of the 18th century.

Acknowledgements

The Sussex Archaeological Field Unit would like to thank the numerous people who made this year's project possible, particularly the owners and tenants of the sites for allowing us to work on their land, and all those who helped in any way. The names of the following must be mentioned at this stage, although detailed acknowledgement will be made in the final reports: Mr E. D. Williams, Mr J. Bell, Mr J. Hadfield, Mrs D. Garton, Mr J. Davis-Gilbert, Mr C. Johnson, Mr A. Sayers, The Department of the Environment and particularly Dr G. J. Wainwright and Dr C. Young, the Firle Estate and particularly Mr P. Smith, Mr R. Barnes, Mr H. Goring and the Wiston Estate, the West Dean Estate, the Uppark Estate, Mr A. Sharson, Mr F. Aldsworth, Mr T. Hudson, Mrs P. Hinton, Mr D. Butler, Mr T. P. O'Connor, Mr I. Blair, Mrs G. Craddock, Mr M. Howe, Mr R.

Howard, Churchman, Burt and Son, Mr E. W. Holden, Mrs H. Holden, Mr C. F. Tebbutt, Brigadier Munn, Mr A. Steeten, Mr K. J. Barton, Miss A. Macaulay, Mr and Mrs K. Astell, Mrs P. Norman and the Lewes District Council.

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The internal structure and regional context of Early Iron Age society in south-western Germany

by SUSAN FRANKENSTEIN and M. J. ROWLANDS

For later European prehistory, the 7th to 5th centuries BC mark a period of renewed and more intensive interaction between the Mediterranean world and Europe north of the Alps. It represents however only a stage in the general sequence of the symbiotic development of the two regions during prehistory and history which has led to the observation on more than one occasion that Europe and the Mediterranean world form a larger system within which local sequences of change must be studied (e.g. Braudel, 1972: 168–70).

However, the present tendency in prehistoric studies is to regard Iron Age cultural developments in Central Europe as essentially independent phenomena, related only in terms of trade with the Mediterranean world. The economic structure of Hallstatt society has been viewed in terms of a feudal model in which a warrior class owned land and other means of production and thereby controlled a peasant class from which they appropriated surplus to exchange for imports and elite consumables. Thus, relations between south-west Germany and the Mediterranean world have been viewed primarily in terms of interaction and exchange between autonomous units and not in terms of their interdependent development as part of a single regional system.

This paper will argue therefore that the internal structure of local societies in the European Iron Age have always to be viewed in the context of their occupying a dependent position in a regional system dominated by the expansion and growth of the more complex and competitive city states and colonies in the central and western Mediterranean. It is only by studying the processes that regulated and organised this larger regional economy that we will be able to understand the conditions for the emergence of local state forms in the late Iron Age based on a semi-commercialised economy which may, in the long term, be crucial for our understanding of the expansion of Rome into Western Europe and the particular decentralised feudal/mercantile formations that followed.

We must begin however by considering the appropriateness of existing explanations for the Early Iron Age based on comparisons with later medieval feudal systems. Kimmig,

the most influential of all Heuneburg authorities, has adopted and elaborated the concept of *Fürsten* in many publications and used the terms *Adelsitz*, *Fürstensitz* and *Herrensitz* as alternative designations for these settlements which he regards as functionally indistinct from medieval burgs and defines by the proximity of *Fürsten* graves, the presence of southern imports and the layout of the settlement to include an acropolis and suburbium. Also, Kimmig regards the late Hallstatt *Fürsten* as intrusive – probably Celtic – and made up of individuals who established their sites of residence and styles of life in ways contrasting markedly with those of other settlements of the time. Thus the original model of (a) an indigenous feudal society in contrast with and therefore influenced by the Mediterranean world is distorted by (b) an attempt to impose a model of conquest and domination, thus separating the *Fürsten* graves from their local context and (c) attributing the *Fürsten* with aspirations to a civilised (i.e. urban) way of life.

Underlying this use of a feudal model is a belief in a cyclical course of historical development. Thus, early medieval society is regarded as a reversion to a pre-Roman situation. The effects of the emergence and expansion of Rome are minimised and the dominance of a specifically European and timeless social form is assumed. There is, of course, considerable value in relating post-Roman society to its pre-Roman counterpart, but if the relationship between Early Iron Age and early medieval society is to be tested, then the general situation must not be assumed to be the same. By the late Iron Age (mainly La Tène C), certain developments had taken place in Central Europe which had clearly altered the structure of European society as it had been in the Early Iron Age. During the Late Iron Age the existence of far-reaching trade networks within Central Europe (and beyond it), the establishment of large scale manufacturing centres, often within walled urban settlements, and the minting of coins are known. Thus, this was a society of essentially different economic and political structure from the Hallstatt D society Kimmig is trying to elucidate. When early medieval society is compared with a pre-Roman counterpart, it is to the Late Iron Age therefore that one should refer. This is not to deny that use of such structural analogues is not required at the theoretical level nor to argue instead that the archaeological 'facts' will speak for themselves. Quite the contrary, we would argue that such analogues have always been made and that a similar but more explicit methodology needs to be employed. We would criticise the use of a feudal model as unsuitable in structure to explain the Early Iron Age concrete situation and instead propose an alternative model derived from various anthropological theories of exchange.

Dehn appears to make an equally inadvisable recourse to later medieval history when he notes that there are reports from the Middle Ages until the beginning of this century of transhumance from the area north-west of the Alps – in particular the Swabian Alb – to Burgundy and sometimes further south (Dehn, 1972). There seems to be no justification to refer to such specific instances of movement when they are confined to later historical patterns of economic specialisation and regional divisions of labour stimulated by the market demands of urban centres. An ecological determinist rationale arguing for transhumance as a necessary adaptation to harsh winters would equally be

subverted by the fact that long distance transhumance is not an ecologically consistent feature even in the later history of temperate Europe but varies with economic circumstances (Slicher van Barth, 1966: 167, 213–14, 255).

A more useful starting point is provided in the largely unpublished work of Driehaus where he attempts to interpret the evidence from the Heuneburg graves and settlements in terms of the economic role of the Heuneburg. Following Kossack's (1959: 10) recognition of, and emphasis on, craft centres in Ha C, Driehaus stress the economic function of the Ha D *Fürsten* residences, particularly in the provision of technical skills, facilities and raw materials for the construction of elaborate artefacts such as wagons and the mass production of simpler items, such as the bronze armings known to have been made at the Talhau. These specialist craftsmen, he suggests, had to depend on their 'customers' for subsistence products and raw materials. Iron, charcoal, wood, skins, wool and surplus foodstuffs would have to be obtained from a large area serving the Heuneburg (Driehaus, n.d.: 282–3). He proposes that the extensive workshops at a *Fürstensitz* would have supplied those *Fürsten* who were not resident at the *Fürstensitz* and whose graves are found further away. A significant part of Driehaus's interpretation is this proposed dependence of the *Aussenposten* on the dominant *Zentralen* which, in the case of Ha D, would be the Heuneburg and Hohenasperg, and as yet unknown sites in the Upper Rhine and Switzerland.

He interprets the grave goods to the *Fürsten* in terms of trade and production. But he offers no adequate explanation of the way in which trade and production for exchange were organised and how they contributed to the maintenance of the *Fürsten*. Instead, Driehaus resorts to a notion of individual ability and choice and attributes the *Fürstengräber* to men who could recognise the 'economic possibilities' of their time and use them to achieve high rank within their society. By attributing modern economic principles of supply and demand, production capacity and business acumen to the organisation of Hallstatt society, he misses the social mechanisms which control and organise economic functions.

The formulation of a model of prestige-goods economy

It is proposed here that real progress in our understanding of the Early Iron Age in south-western Germany can only be achieved by the rigorous application of a model based on general anthropological theories, of exchange, and in particular on the work of Meillassoux (1960), Dupré and Rey (1968), Dupré (1972), Ekholm (1972), Sahlins (1963, 1968, 1972), Strathern (1971) and others. Their formulations have been tested on cases in different parts of the world. The association of political power with control over access to foreign goods which are assigned high status has been observed and analysed. They have defined and demonstrated the function of these 'prestige-good economies'. The general value of their work on relations between economic and political organisation and the explanatory value of their theoretical framework will be demon-

strated by the formulation and application of a model of the prestige-good economy to the Central European case.

Of course, the nature of the archaeological data differs from the data they used to test their hypotheses, viz. traditional accounts, some historical documentation, and present ethnic distributions and organisation. But the advantage of the data available to prehistorians is to provide a unique opportunity to both extend the application of the model to different data and to test the model in constant conditions over a long period of time.

The general theory attempts to relate certain aspects of internal group structure to external ranking as a process of hierarchisation over time and refers to the writings of those anthropologists (cited above) who have focused on the control gained through the manipulation of external exchange relations by descent group heads (e.g. Strathern, 1971), and those which have been concerned with the competitive, demographic aspects of competition and ranking between descent groups (e.g. Dupré, 1972; Ekholm, 1972).

The specific economic characteristics of a prestige-goods system are dominated by the political advantage gained through exercising control over access to resources that can only be obtained through external trade. However, these are not the resources required for general material well-being or for the manufacture of tools and other utilitarian items. Instead, emphasis is placed on controlling the acquisition of wealth objects needed in social transactions, and the payment of social debts. Groups are linked to each other through the competitive exchange of wealth objects as gifts and feasting in continuous cycles of status rivalry. Descent groups reproduce themselves in opposition to each other as their leaders compete for dominance through differential access to resources and labour power.

At an early stage, in a tribal system made up of groups linked together in this form of simple competitive alliance, it can be anticipated that only locally domestic goods would be available for social transactions. It would seem likely therefore that it would be those groups that were able to produce a surplus of foodstuffs – as a function of a differential in productive capacity – that would stand to benefit, in short term, in the local political arena. Investing such surpluses in wealth objects for the acqusition of more wives and hence dependents, acts to increase the demographic strength of the local support group in order to meet the demands of continuing in this competitive cycle.

No sumptuary laws or monopolies in acquiring wealth objects are necessary for this to occur. Since clan heads are the owners of means of production, they control the dispersal of surpluses and the exchange of wealth items for individual members to reproduce themselves. Whilst all groups have access to external exchange, it is those with the economic and demographic capacity to gain access to new sources of prestige goods or to particularly large quantities of existing prestige goods that would establish a dominant position. A cycle of differential growth in group size and dominance emerges therefore which has two main aspects. Firstly, the increased capacity to obtain wealth objects through external exchange implies that a clan head will be able to maximise his network

of matrimonial alliances to obtain wives for himself and his descent group members. Secondly, it implies that poorer descent groups will become dependent on more dominant descent groups for supplies of wealth objects needed for their own survival. These poorer descent groups will therefore be encouraged to direct their economic activity, i.e. their supply of domestic resources and specialities, towards dominant groups rather than towards external trade partners.

This more hierarchical situation agrees very closely with the pattern Ekholm has found in her analysis of the Kongo kingdom (1972), to which she adds the dimension of a cycle of social debts. Members of poorer descent groups fall into debt if unable to pay wealth objects for social debts and instead have to deliver a member to the superordinate group. This person would be stripped of his – or her – original status, and be incorporated into the superordinate group. Dominant groups may either retain their own women by marrying them to debt slaves or give them to potential or actual allies for the creation or maintenance of external alliances.

At this point in a process of hierarchisation, a dominant chief can reinforce control over the internal circulation of wealth objects by narrowing down and monopolising the range of items acceptable in social transactions within his domain. The use of domestic wealth objects will be devalued and restricted to relatively minor social transactions, and a sphere of foreign wealth objects will be formalised to take their place. The exchange of luxuries consumed by emergent elites, reinforced by sumptuary laws, will form an important part of the process. By controlling the size of payments or the form in which payments are made and the supply of elite status items, leaders confirm their superordinate status over the heads of segments within their own descent groups and over other dependents. The chief's control over external trade in wealth objects is absolute so that he alone obtains commodities from a foreign source which he can then redistribute in the form of status insignia, funerary goods, bridewealth, etc. Tribute, in the form of domestic surpluses, is passed up through the same system. These commodities are then used by the dominant chief for obtaining wealth objects from his external trading partners.

This serves to emphasise the importance of political control over the domestic resources that form the source of exchangeable wealth for external trade. Under these conditions, there will be a tendency to select for those resources that are not found to be redistributed evenly and can therefore be more easily controlled. The exploitation of metals, salt, shells, stone, etc., within a domain would be controlled and the products passed up as tribute through the political hierarchy to a superordinate chief, who would use them in external trade. Descent group heads would out of necessity have to direct the labour power available to them to produce such commodities to be pooled and passed up to a central point together with foodstuffs and other ideological signs of subordinate status. The exploitation of certain resources that require labour-intensive techniques (e.g. mining) would be limited to those clan heads capable of controlling a sufficiently large workforce.

But, when the technical skill required for the working of certain resources – such

as metal – is not accessible to everyone, then control over production of wealth items is as convenient as control over the actual sources. There would be considerable incentive to develop specialist skills not attainable at the local settlement level and to control the use of these skills in the production of prestige and status items (as observed by Dupré (1972) in the Tsengi-Nzabi system). Foreign trade would increasingly be restricted to providing luxury items, in exchange for domestic surpluses for the consumption of dominant clan members. Centralised control over the production of local prestige items hence facilitates an increased monopolisation and consumption of wealth by elites with a minimum of redistribution to subordinate members. This is an emergent process to be found to varying degrees at different levels of hierarchy.

A dominant chief has to redistribute sufficient quantities of prestige goods to his subordinates. Failure to do so would undermine his superordinate status, since his dependents redistribute in turn to their dependents. In a sense, therefore, tribute is not a one-way flow but appears as an agreed exchange between subordinate and superordinate chiefs for the maintenance of the political position of each. For this ranking to be maintained, subordinate lineages must not be allowed to participate in external trade for wealth objects. This may be checked by the fact that reciprocal exchange can only occur between equals, i.e. a dependent chief cannot trade with a dominant chief of another tribe. Whilst at the beginning differential control over labour power creates imbalance in inter-lineage clan competition, at an expanded point in the process of centralisation large segmented clans may result though absorption of dependent lineages whose leaders maintain elite status through various sumptuary laws.

A potential equilibrium exists at any point in this process of hierarchisation given a stasis between the productive capacity of local groups and the limit of unacceptable levels of appropriation of surplus products by leaders needed to gain access to new sources of wealth objects. Further expansion is possible only if a dominant chief manages to maintain a monopoly on trade and acquire a new source of foreign wealth objects. He is then able to use his economically strengthened position to transform his external relations with trade partners of equal status into internal relations of superordinate and subordinate rank. The formerly dominant chiefs would no longer be his status equals and would become vassal chiefs, no longer in a position to trade with other dominant chiefs, and would have to direct their trading activities to the now paramount chief.

From this state of the political system, three possible lines of development can be envisaged, although over time they are not mutually exclusive. Firstly, unlimited expansion – particularly at the level of the formation of new external political alliances – is likely to be checked by the tribute demands on dependents that it would entail. The increasing demands for the exploitation of local domestic resources and the attraction of manpower into craft production, to serve the need of external exchange, would compete for labour-time needed to provide basic foodstuffs. With increasing hierarchisation, we can expect an emphasis on warfare to gain slaves to meet an increasing demand for labour. Thus the need to expand the size of dominant descent groups at the expense of subordinates will intensify in ratio to the amount of tribute demanded and the supply of

wealth items available for redistribution. This inflationary spiral has logical contradictions which would ultimately bring about the collapse of the system.

The second possibility is for the paramount chief's monopoly over external trade to be broken, particularly if external trade relations are with an economic system organised on different principles. For example, if specialist traders are representing an external source, it may be to their advantage to maximise the number of outlets and to subvert the monopoly of the dominant chief. This development is likely to occur in conjunction with the first possibility since the tendency to maximise outlets can be seen as a response to a situation of diminishing returns contradicting the capacity of a local paramount to satisfy the needs of external trade partners necessary to maintain his own monopoly. If this occurs, then vassal chiefs may regain their independence and competing centres would develop within a previously uniform political domain. Each of these centres will compete for control over population and resources in order to expand at each other's expense and at the expense of the originally dominant centre.

Thirdly, if the external trade connections of the paramount chief are broken – either because of changes in the external system with which he is linked, or because of shifts in the location of trade routes and blocks in communication – due possibly to internal conflicts resulting from the above tendencies – then he is no longer able to maintain his superordinate position over vassal chiefs and sub-chiefs. In turn, their position will be at risk unless they are able to establish independent external trade relations, for example with the paramount's former trade partners. Sub-chiefs in the peripheral areas will be the first to lose their supply of prestige goods and thus their means of control over population. The political domain will appear to contract from the periphery inwards as supplies from the paramount chief increasingly fail to percolate down through the hierarchy of vassal chiefs.

This type of system is therefore unstable both in terms of contradiction within its internal functioning and also in terms of dependence on an external system over which it has limited practical control. Its internal conditions of existence rely on the capacity to mobilise lineage resources in order to maintain dominance over tribute relationships. As part of a wider regional system in which there may be a number of relays between a paramount and the suppliers of wealth objects, these systems are linked into a wider structure based on more abstract relations than have been dealt with here.

It is worth noting, however, that production for exchange is a constant feature of this type of social system. It is a matter of scale rather than discrete change whether this involves only local surpluses and wealth items or involvement in a wider regional system. It is the latter strategy that allows local societies to participate in a wider system of circulation of wealth and realise their fuller evolutionary potential. This must be particularly so when links are established with external systems organised on different economic principles. In such situations, trade partners may exchange what could be viewed by their respective populations internally as low value domestic items for external high value wealth items. Both partners gain in a manner significantly different from trade between similar systems; since this would necessitate an exchange of commodities used

by both partners as wealth items before trade could take place. The conversion of low values to high values acceptable to both partners can therefore only exist when the systems of trading are organised on different rationalities and have different needs of each other such that maximum profits for almost zero costs may be achieved. This would account in general for the phenomenal expansion of local tribal systems that historically established contact with trading partners in city states, merchantile capitalist or industrial capitalist systems.

The internal contradictions described above are realised, therefore, within the context of a wider set of external contradictions, through a dependence on external demand and a wider productive area over which such local centres have no effective political control. One can, therefore, predict a cycle in which increasing external demand can be satisfied by local intensification only at the risk of bringing into play internal contradictions which in turn create conditions of instability that threaten the security of external trading partners. At the local level, any attempt to maintain the structure through an increased use of force both to obtain new sources of labour (slaves) as well as to cohere existing power relations would be subverted by the response of external trading partners who would maintain their position by subverting local monopolies and by establishing new links with more stable structures.

It has been convenient to think in terms of a single source of external demand for understanding the development of this local pattern. But the reality of these situations is more complex. Competition between centres at the local level (periphery) is likely to be replicated and stimulated by competition for dominance amongst their external trading partners (core centres). Disruption and subversion of long-distance trade is a constant feature of the history of such local systems. Since the expansion of core centres is dependent on their capacity to monopolise their peripheries, this must entail the reciprocal development of competing points of accumulation within the core area consistent with their ability to control access to resources in the peripheral areas. Hence, the emergence of local competing centres in peripheral areas is directly related to the emergence of competing centres in the core area.

There is a point at which the centres in the core area will recognise the value of using mass-produced objects – known from experience to be to the taste and requirements of their contacts in the peripheral areas – to maintain their dependence. In contrast to the previous phase of exchange between core and periphery – in which existing, heterogeneous sumptuary items were used – a situation is now found in which an increased interdependence has stimulated core centres to devote part of their productive effort to the manufacture of a restricted range of wealth objects specifically for peripheral demand. This development would provide an incentive for intermediaries to adopt a more specialised role in their intervention between core and peripheral centres. A middleman function already exists in controlling and facilitating flows of goods along natural communication routes, but a more secure position exists in directly supplying the manufactured goods and luxury items primarily for specialist traders. With gradual acculturation of populations in the immediate hinterlands of the core centres, an inter-

mediate zone is formed between core and periphery (Wallerstein, 1974). In many cases it can be expected that these populations are largely dependent on playing a middleman role in the exchange between core and periphery. There is also a tendency for a spatial extension of the intermediate zone into the peripheral zone, such that the system's peripheral zone is constantly being extended outwards.

Finally, two patterns of change can be predicted within the system as a whole. Firstly, the internal contradictions within peripheral domains combined with competition for advantage among core and intermediate centres will generate a regional pattern of considerable complexity seen in the expansion and decline of different centres in all three zones. Hence, we can expect localised shifts in dominance in one part of the regional system to affect – either directly or indirectly – other parts within it. However, since the relationship between the core centres and peripheral areas is the basis of the regional system, crises in the core area could lead not only to a shift in dominance in the peripheral area, but also the collapse of the whole system of dominance. A crisis in the core area can therefore undermine the system of local dominance that it has generated on its periphery. Hence, the relations between core centres are critical for the maintenance of the system as a whole, whilst crises in the peripheral areas will represent only minor oscillations of shifting dominance (Wallerstein, 1974).

Secondly, the peripheral domains will be at greatest risk if a crisis occurs in the regional system as a whole. Increasing antagonistic relations between core centres could disrupt the regional system and the stresses thereby set on the peripheral zone would put the very survival of the peripheral structures at risk. Thus, the rivalry between core centres will be overshadowed by the repercussions in peripheral domains, which may in turn threaten the existence of the core centres.

The archaeological indicators

The processes embodied in the general model imply certain essential characteristics that, when translated into material culture form, can be used to reinterpret the available archaeological data in a more meaningful way. At this point there is an inevitable loss in analytical depth and precision as the transition is made from general modelling to hypothetical transformation of the model into material culture terms and subsequently the matching of material expectations to what is available in the archaeological record.

In the structure outlined in the model, political power is not directly linked to subsistence; so that by definition foodstuffs would not be passed up as tribute. Therefore we need not expect the intervention of centralised political authority in subsistence production, involving either technological innovation or the introduction of new crop complexes in order to increase surpluses. Instead, mobilisation of resources occurs within clan or lineage segments for the support of local leaders, sub-chiefs and paramount chiefs. Local resources include both foodstuffs and local specialities, but it is the production of the latter that is more likely to be controlled and at least in part passed up as tribute for

redistribution and use in external trade. As a correlate of this we can expect direct control to be exercised over certain craft activities, particularly over the production of those artifacts requiring degrees of technical skill to which high social value and esteem could be attached, e.g. metalwork, pottery and cloth. Hence there should be a degree of correspondence between the esteem or value attached to certain craft items; their significance as status conveyors in the political system and the point in the political hierarchy (hence settlement pattern) at which control is exercised over their production. We might expect therefore that fairly utilitarian items – such as woodwork, basketry and domestic pottery – would be manufactured at a domestic household level; low value commodities such as tools or simple ornaments manufactured at the village level; and through an ascending hierarchy of grades of wealth objects and insignia, to the production of the most sophisticated prestige items being controlled at the paramount level.

This in turn would place a greater responsibility on more dominant chiefly clans to support craft specialists. Since dominance is largely a function of the productivity of support groups, the demand for labour and size of descent groups increases in proportion to relative importance in a chiefly hierarchy. The support of part-time to full-time specialists and the intensification of craft production for internal redistribution and for external exchange depends, therefore, on the capacity of a paramount chief's support group to intensify food production, primarily by changing the ratio of labour to land rather than through technological innovation. Hence chiefly power is ultimately contingent on the number of dependants absorbed into a chiefly clan, a factor which may be reflected both in the settlement pattern evidence (size and number of domestic structures, storage of food surpluses, workshop areas) and possibly in the burial practice (e.g. ranking and number of secondary burials in relation to primary 'chiefly' burials).

As already discussed, external exchange between trade partners involving the reciprocal exchange of domestic resources and wealth objects is the basis of the cohesion of this political structure. Inter-regional trade, therefore, can be seen as a series of links between the heads of separate political domains and possibly specialist traders representing more distant trade partners. What passes between them may be both a mixture of foreign status items as well as exotic raw materials which could be fashioned locally into wealth objects and status insignia for redistribution. Internally, the distribution of such items within a domain should show a high degree of stylistic uniformity and a scalogram effect in the sense that a more complex assemblage of status insignia and wealth objects can be anticipated at higher levels in a chiefly hierarchy than at lower levels. Hence in a strongly hierarchical structure, vassals and sub-chiefs are likely to obtain insignia of their status from a paramount, so that political ranking will be represented by differential access to status insignia and regalia. Both of these effects in the distribution should in turn be confirmed by technical and compositional evidence linking widely dispersed craft items to a single, centralised point of manufacture which, in the case of the more important categories of insignia and wealth objects, should be situated in the settlement of a paramount chief. Similarly, where more than one domain is linked to a common external source of foreign imports and raw materials, it is unlikely that

clear-cut differences in wealth and insignia will be found in each domain, although it could be anticipated that different values will be applied resulting in different combinations of materials and status insignia in different domains.

The extent of a domain and the definition of its sub-domains in an archaeological context could be recognised minimally by the uniformity of particular combinations of prestige objects, by tracing them to centralised points of manufacture and distribution and contrasting their distribution with the greater stylistic variation of domestically produced commodities. The structure of each sub-domain can also be defined by the different ranked status of burials, reflecting levels in the political hierarchy. In some cases the presence of secondary burials in a tumulus may be used to understand the internal ranking within a group.

Spatially, the political structure appears as a series of sub-domains with a single political domain. At the most developed stage in the hierarchisation process, each domain or sub-domain will have a paramount or vassal chief at its head. The vassal chiefs would be linked by tribute relations to the sub-domain of a paramount. Below the vassal chief or paramount, one can anticipate at least one level of sub-chiefs who could have political authority over a number of village heads or over an intermediary level of lesser chiefs.

Whilst control over external trade is a prerogative of the paramount, control is restricted to those resources and items that carry highest status or value in internal and external exchange transactions. Control is exercised therefore not by force but by limitations on the kind of goods that lesser chiefs are able to mobilise for external exchange. Hence, it should be impossible for them to obtain external trade partners and receive those goods that are in fact controlled at a higher level. The structure itself therefore determines what kind of goods or resources can be channelled into external exchange at different levels within the hierarchy. In the sense that vassals and sub-chiefs are legitimated through their relationship to a paramount, they have a vested interest in maintaining the structure as long as the tribute/redistribution network continues to maintain their position. Ideological functions will also act to maintain and legitimate the structure, particularly in the framework of mythical charters and ritualised access to resources and rights to modes of address, behaviour, costume and other ceremonial and ritual paraphernalia.

Since the position of a paramount depends on his controlling external exchange of highest status goods, he in turn acts as a dependant of an external system whose structure may be only vaguely comprehended. In the same way as vassal chiefs will have a number of the accoutrements of a paramount, the paramount will take on patterns of dress, custom and even burial rites characteristic of the cultures with whom he is in contact.

Finally, certain tentative predictions can be made concerning the patterns in the archaeological record that derive from our understanding of the logical contradictions inherent in such structures. For example, internal conflicts within a dominant clan or between it and rival descent groups, resulting from the intensification of tribute and redistribution required in order to maintain expansion, could be witnessed in evidence of hostilities and dynastic change at the paramount's centre. A continual state of insecurity

might put the perpetuity of external exchange relationships at risk. If external partners solve their problems by establishing links at lower levels in the hierarchy then a collapsed pattern of competing centres within a previously uniform domain should emerge, with each subdivision now being distinguished by the same criteria that had previously characterised the domain as a whole.

The case

There is now considerable evidence that the emergence of a powerful chiefdom in the Heuneburg area in Ha D was due to internal changes in the Ha C, Alb-Salem cultures, rather than due to conquest or a change in population. Continuity is recognised in the tumulus cemeteries which have both Ha C and Ha D1 burials; in the burial site characteristics of Ha D, i.e. inhumation, which is seen to begin in Ha C; in continuity of settlement, e.g. at the Heuneburg; and in continued use in Ha D of pottery styles of Ha C origin (Paret, 1933–5b, 1935–8; Zürn, 1943). But as is well known, the D1 developments in the Heuneburg area coincide with the establishment of trade links between the western part of Central Europe and Greek colonies and Etruscans in the western Mediterranean via the Rhone Valley and the western Alpine passes. Our concern, therefore, is to firstly establish the internal structure of the Heuneburg, as one of the domains affected by these contacts, and subsequently to establish its position in this wider exchange network.

The Heuneburg domain in the D1

The primary evidence for the internal structure of the Heuneburg political domain comes from burials. On the basis of this evidence, four levels in the political hierarchy can be defined:

1. *Paramount chief status.* This is defined by inhumation burial in a wooden chamber, containing a wagon and horse trappings, imported (or locally made) bronze vessels for wine drinking, imported gold sheet and objects, silk and gold thread, large quantities of cloth, imported glass, amber and coral. The wagon and inhumation burial are traditional Ha C indicators of chiefly status (Kossack, 1959; Ruoff, 1974) but the other features are characteristics of Greek and Etruscan burial custom and status.

2. *Vassal chief status.* This is defined by a similar, but simpler, burial by inhumation with a wagon, horse trappings and bronze vessels. However, many of the imported sumptuary items – including the gold, the quantities of glass, the amber and coral – are lacking. Instead, technically sophisticated bronze weapons and jewellery are found; there is evidence to indicate that they were produced at the paramount settlement.

3. *Sub-chief status.* This is defined by the presence of a wagon or usually by a part of a wagon associated with burial by inhumation. Contents may include imported items, also elaborate bronze daggers, belt-plaques, bronze or lignite armbands of centralised manufacture and distribution.

The distinguishing characteristic of all three of the highest status levels is the presence of a wagon which has been shown by Kossack (1959) to be a traditional indicator of high status during the Hallstatt period in the eastern and western zone north of the Alps.

Below the sub-chief level, two other status levels can be recognised:

4. Minor chiefs or village chiefs status is defined by exclusion from wagon burial and absence of imported sumptuary items. However, some of the centrally produced items – such as daggers, belt plaques and arm-bands – are found in some burials, as are the widely distributed, small items of bronze jewellery, such as earrings and fibulae. Other items, which appear to be locally produced, such as simple bronze arm- and footrings, iron weapons and pottery, are among the contents.

Table 1 Scalogram of grave contents of paramount, vassal and sub-chief in the Heuneburg domain, Ha D1

Site No.	Burial	Wagon	Trappings	Bronze vessels	Cloth	Gold	Glass/amber/coral/ivory	Bronze weapons	Lignite	Bronze belt plates	Bronze armrings	Bronze fibulae	Iron weapons	Bronze pendants and earrings	Pottery
1	Hohmichele I	X	?	?	X	X	X			X					X
1	Hohmichele VI	X	X	X	X		X			X		X	X	X	
12	Vilsingen	X		X							X		X		X
15	Buchheim	X	X	X			X						X		X
34	Winterlingen	X					?						X		
27	Ebingen I	X	X					?		?		X	X		X
21	Sulz a.N.	X													
52	Eggingen	X													
37	Grossengstingen	X													
65	'Urach'	X													
5	Ertingen			X			X		X					X	
63	Hailtingen			X									X		X
26	Ebingen			X						X	X	X	X		
29	Truchtelfingen	X						X				X			
9	Laiz	X								?					X
38	Meidelstetten	X											X	X	X
42	Marbach	X													
46	Böttingen	?								?					
13	Engelsweis	X													
32	Bitz	X										?			
47	Berghülen	X													
54	Emerkingen	?													
33	Gauselfingen	X													
11	Sigmaringen	X										?			
14	Ringenbach	X													
40	St Johann	?													

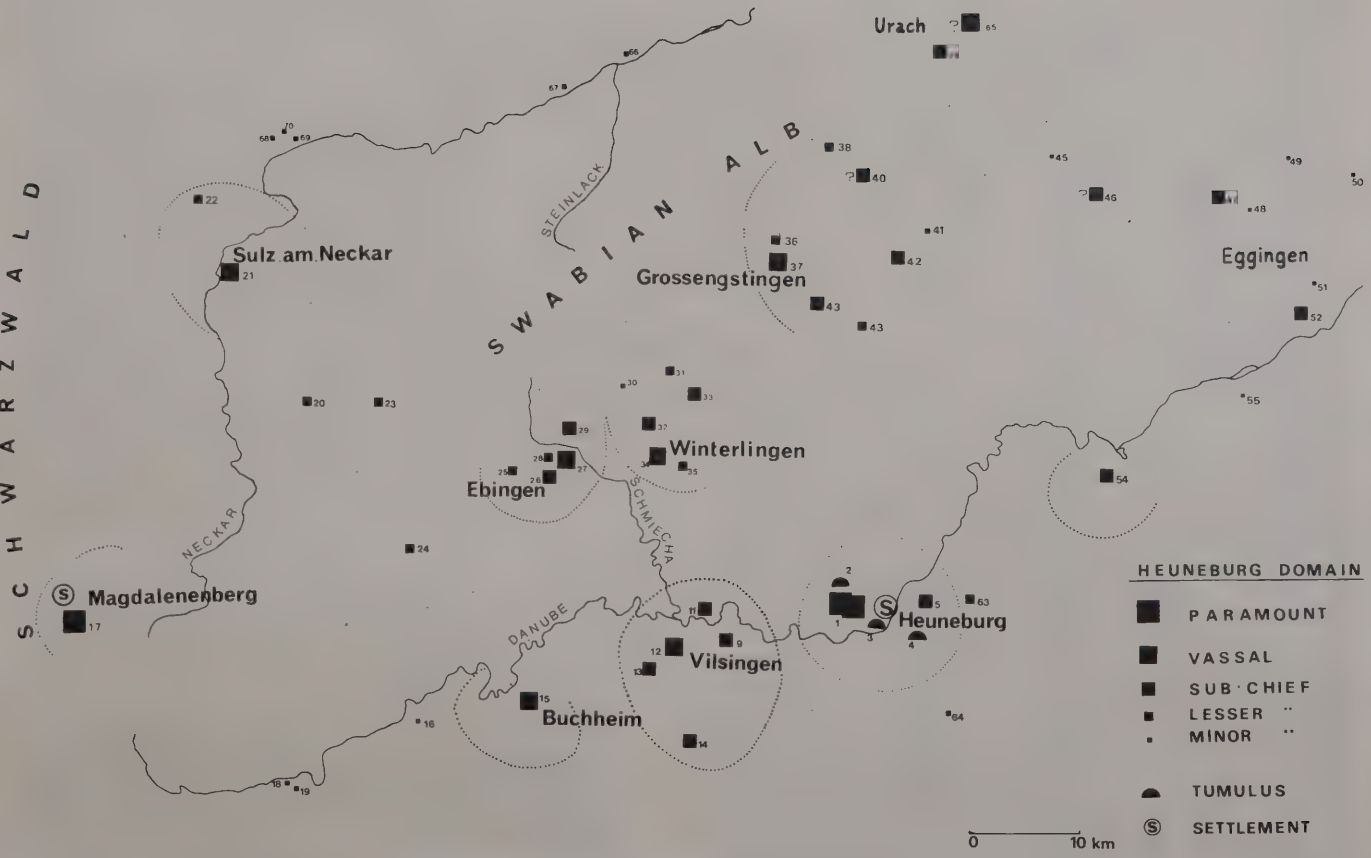

Fig. 1 Map of Heuneburg domain (Ha D1).

5. Most of the burials below the first four status levels are less likely to have been recorded and are usually known to occur as poorer secondary burials in tumuli. The usual contents are represented by simple bronze ornaments, such as a fibula or armring, an iron implement – such as a knife or a spearhead. In many cases, however, it can still be said that certain items – like the fibulae – were centrally produced and must have been redistributed through the chiefly hierarchy to this low status level.

Using these definitions it is possible to reorganise the grave contents in tabular form to show a scalogram effect of descending frequency in combinations of elite goods in what is assumed here to represent differential ranking in the political hierarchy (Table 1). The general validity of these subdivisions would seem to be confirmed when plotted on a distribution map showing the subdivisions of the paramount chief and those of his vassals (Fig. 1).

The empirical evidence seems initially to fit the pattern predicted in the indicators quite well. All status ranks within the Heuneburg domain appear to be defined in relationship to each other through their differential access to polythetic sets of status items which – in 10 out of 14 cases – can be justifiably interpreted as foreign prestige objects or access to centrally produced status items necessitating high degrees of technical skill and the use of imported raw materials. The table would also appear to display a second pattern of variation reflecting a difference in the function or value attached to these different items. Whilst the first six items (wagon, horse-trappings, bronze vessels, cloth,

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Fig. 1 List of sites.
1 Hohmichele, Gem. Heiligkreuztal.
2 Kleine Hohmichele, Gem. Heiligkreuztal.
3 Lehenbühl, Hundersingen.
4 Bettelbühl, Hundersingen.
5 'Rauher Lehen' Ertingen, Kr. Saulgau.
9 Laiz, Kr. Sigmaringen.
11 Sigmaringen 'Ziegelholz'.
12 Vilsingen, Kr. Sigmaringen.
13 Engelsweis, Kr. Stockach.
14 Ringenbach, Kr. Sigmaringen.
15 Buchheim, Kr. Stockach.
16 Ludwigstal, Kr. Tuttlingen.
17 Magdalenenberg, Villingen.
18 Mauenheim, Kr. Donaueschingen.
19 Bargen 'Zimmerholz', Kr. Konstanz'.
20 Dautmergen, Kr. Balingen.
21 Sulz-am-Neckar, Kr. Horb.
22 Dürrenmettstetten, OA. Sulz.
23 Dormettingen, Kr. Balingen.
24 Bubsheim, Kr. Tuttlingen.
25 Hossingen, Kr. Balingen.
26 Ebingen, Kr. Balingen (Schmiechatal).
27 Ebingen, Kr. Balingen (3 km south-west of Ebingen).
28 Ebingen, Kr. Balingen (Degenfeld).
29 Truchtelfingen, Kr. Balingen.
30 Hermannsdorf, Kr. Sigmaringen.
31 Bitz, OA. Balingen.
33 Gauselfingen, Kr. Hechingen.
34 Winterlingen, OA. Bailingen.
35 Harthausen auf der Scheer, Kr. Sigmaringen.
36 Grossengstingen, Kr. Reutlingen.
37 Grossengstingen, Kr. Reutlingen.
38 Meidenstetten, Kr. Münsingen.
39 'Burrenhof' Erkenntsbrechweiler, Kr. Nürtingen.
40 Würtingen St Johann Gem. Würtingen.
41 Steingebronn, Kr. Münsingen.
42 Marbach, OA. Münsingen.
43 Oberstetten, OA. Münsingen.
44 Indelhausen, Kr. Münsingen.
45 Zainingen, Kr. Münsingen.
46 Böttingen, Kr. Münsingen.
47 Berghülen, Kr. Ulm.
48 Asch, OA. Blaubeuren.
49 Tomerdingen, Kr. Ulm.
50 Beimerstetten, OA. Ulm.
51 Ermingen, OA. Blaubeuren.
52 Eggingen, OA. Blaubeuren.
54 Emerkingen, Kr. Ehingen.
55 Öpfingen, OA. Ehingen.
63 Hailtingen, OA. Riedlingen.
64 Buchau, OA. Riedlingen.
65 'Urach', Kr. Reutlingen.
66 Tübingen 'Flurgeigerle'.
67 Wolfenhausen, Kr. Tübingen.
68 Salzstetten, Kr. Horb.
69 Hochdorf, Kr. Horb.
70 Untertalheim, Kr. Horb.

gold, glass/amber/coral) co-vary on a presence/absence basis with rank, the lower order items – in particular the smaller items of bronze jewellery such as earrings, fibulae and armrings – occur at all levels in the hierarchy. In other words, if these polythetic sets simply represented insignia of political rank, then one would expect these lower order commodities to occur mainly at the lower rank levels. Instead, these items are found at all levels of the social order and seem better interpreted as items indicative of adult social status and clearly needed to be acquired by all social adults (male/female). They could not, therefore, be used to indicate political rank but performed more general functions within the society. But there is considerable evidence to suggest that even the band earrings and snake and bow fibulae were centrally manufactured and distributed, i.e. their complexity of form and general uniformity of style would indicate non-local production and distribution. This pattern of uniform value and centralised manufacture and distribution would support their being interpreted as prestige items which all adult males would have had to acquire to achieve full adult social status. If their distribution was controlled from a central point then we must assume that this provided a significant source of power over the whole adult male population for the central chiefdom institutions.

The way in which the different levels in the hierarchy are linked to each other and ultimately to the paramount chief can be shown in greater detail. As stated above, the three highest status levels are linked by possession of a wagon. As Kossack (1959) and Driehaus (n.d.) have pointed out, these are complex artifacts composed of elements requiring different kinds of specialist skills. Schiek (1954, 1956) has shown that all the wagons of D1 (his type A) have marked similarities in the details of their construction. Thus, Schiek (1956: 132) describes the similar hub arrangement of the Hügelsheim, Vilsingen and Winterlingen graves and a grave of unknown location in the Urach area, i.e. iron rings with a bronze sheet covering. An iron ring joining the *Nabenhals* to the *Mittelstuck* (hub) covered with bronze, is found in all the above graves and also in Hohmichele VI. The Vilsingen wagon had bronze hub-caps as did the wagon from Suiz a.N. (Paret, 1935: 21; Schiek, 1954). Among these wagons, Hügelsheim, Vilsingen and Winterlingen are described by Schiek (1956: 133) as forming a 'special group' within type A because the details of their construction are so alike that he believes they must have come from a single workshop. All the D1 wagons listed by Schiek (1954) have large-headed iron nails fixing the iron tyres to the felloes. Different types of semi- and cylindrical fittings are found at Hohmichele VI, Vilsingen, Hügelsheim and Laiz. Bronze spoke covering is found at Vilsingen and Hügelsheim; and various types of strap crossings are found in Hohmichele VI, Buchheim, Ebingen and Kappel.

In Ha D1, the manufacture and distribution of these wagons must be attributed to the Heuneburg (cf. Driehaus, n.d.). Significantly, iron tyre fragments and large-headed nails are known from the settlement.

The form and materials of other grave goods show further connections between these graves: for example, there are iron *Hiebmesser* in Hohmichele VI, Vilsingen and Winterlingen (and Steingebronn, without a wagon). Similar imported bronze vessels are

found in Vilsingen, Winterlingen and Ertingen. Harness fittings occur in Buchheim and Hohmichele VI (i.e. distinctive types of strap-crossing). There are particularly striking similarities in the grave contents of the paramount burial at Hohmichele VI and the sub-chief burial at Ertingen (Paret, 1933–5a; Schiek, 1954, 1956) which is within the Heuneburg sub-domain. They share certain forms of bronze pendants, amber and glass beads and whetstones.

These connections between sub-vassal and paramount chiefs are further strengthened by the evidence for centralised production of bronze, iron and lignite objects, painted pottery and cloth (Bittel and Rieth, 1951: 50) in the Heuneburg. Large scale bronze-working, i.e. the many 'workshop areas' in Phase IV levels and the indications of casting debris, moulds, discarded casting, are relevant here. Although iron-working is noted in many publications, very few details of the evidence are given. The most detailed data is still that of Bittel and Rieth (1951: 33-4, Taf. 10 and 11, Abb. 5a and b) in which iron material from a trench within the settlement is described and illustrated: it included knife fragments, even a thrusting knife (*Hiebmesser*), and the pieces of iron tyre and nail. Bronze working and finds of fibulae, sheet bronze and scrap are referred to by Kimmig and Gersbach (1966, 1971) and Kimmig (1968, 1975). Bittel and Rieth (1951: 32 ff, Taf. 11) refer to moulds and other casting evidence from the site. The extent and the nature of bronze and ironworking on the Heuneburg is still unpublished and has to be deduced from the finds in the burials and their interpretation.

Bone spacer beads are found, lignite and jet working is also known to have taken place (Rochna, 1962; Kimmig, 1968). In addition, as Zürn (1943) had predicted, the centre for the production of the characteristic painted pottery of D1 has, on the basis of the range and variety of finds there and the specialised firing techniques involved, been located at the Heuneburg (Bittel and Rieth, 1951; Kimmig, 1968: 78).

According to Kimmig (e.g. 1968), the glass found in the graves was made locally – at the Heuneburg. From the large numbers of loom weights and needles found on the fortified and open sites, we know that cloth production was on a large scale, and from the cloth embroidered with silk or golden threads found in the *Fürsten* graves, we know that some of the cloth was of extremely high quality (Riek and Hundt, 1962; Hundt, 1969). It was probably distributed as a prestige item, thus contrasting with locally made material. In other words, there is direct evidence of workshop production as well as the stylistic and technical evidence to link the distribution of most of the status insignia and wealth objects found in the sub-domains to the paramount centre. The objects distributed from this centre also vary in quantity within each sub-domain and are found in large numbers only within the Heuneburg sub-domain, e.g. Hohmichele I contained more than 400 glass beads, amber bead necklaces, and large quantities of cloth (lining the chamber and covering the wagon), whilst elsewhere they are found in much smaller quantities.

As mentioned in the indicators, this pattern of centrally redistributed prestige items showing marked uniformity in style, should contrast with regional variation in the locally produced, primarily domestic, craft items. At the present time, this pattern is found for

the domestic pottery: many local wares were produced on the Alb during the Ha D1 period (Zürn, 1943), in contrast to the richly decorated forms that were manufactured at and distributed from the Heuneburg. It is significant to note that of all the items found in the graves of every rank only certain kinds of ironwork and pottery can be said to be of local manufacture. Hence items that were considered of importance to be disposed of in funerary ritual appear to be mainly those that were distributed through the chiefly hierarchy. Also, as Driehaus (n.d.) and others have noted, craft skills were invested in the production of items that required considerable technical expertise, combinations of raw materials and workshops to produce, i.e. items that were being passed down were also symbols of chiefly control over complex craft skills and the acquisition of raw materials that could not be replicated at the local level. The centrally produced and distributed items are more complex in technique that those made locally and may have been either imported or manufactured at the centre from imported raw materials, i.e. hollow bronze neckrings, 'barrel' armbands of bronze sheet or lignite, bronze sheet earrings, amber beads and pendants, glass beads, bronze pendants or imports, such as the snake fibula with rosette and horns from Ebingen (Paret, 1933–5b). Where found in small quantity the status value of the item is likely to be considerably increased, e.g. one glass bead in a grave at Ebingen and others from Durrenmettstetten (Paret, 1924) and Magdalenenberg graves.

If this interpretation of the distribution of prestige objects as reflecting the extension of political control by the paramount chief is correct, then confirmation can be expected from evidence of tribute being passed up from sub-chiefs and vassal chiefs to the paramount. In this regard there is said to be evidence for prehistoric iron-working on the Uracher Alb (e.g. Paret, 1967); thus iron working can be proposed as specialist activity in the Grossengstingen and Winterlingen sub-domains on the Alb. The exploitation of lignite in the (Balingen) area of the Ebingen sub-domain has already been demonstrated by Rochna (1962). It seems likely, therefore, that the iron and lignite known to have been worked at the Heuneburg were passed up as tribute by the vassal cheifs of these sub-domains. Furthermore, the worked lignite was used in external exchanges: eastwards, in southern Bavaria, and westwards, in the Upper Rhône centres (from where it would have been further distributed to Switzerland, especially the Bern area, Alsace, and west of Freiburg i. Br.). Rochna (1962) regards the armrings, narrow and broad armbands found in southern Wurttemburg as D1 material; their occurrence in the more distant regions of Switzerland and Alsace are generally regarded – by him and others – as of a later (mainly D2) date. He stresses the location of the lignite finds on river crossings in Bavaria, and their association with the characteristic pottery with red painting on a white background (cf. Kossack, 1959). He also emphasises the problem of locating the sources of lignite and suggests that in D1 at least three types were in use. The lignite material of armbands found in Tailfingen-Truchtelfingen, Ertingen, Dottingen and Tannheim is the same. This supports the proposed centralised manufacture and distribution from the Heuneburg, despite the fact that some material found there is of a different type.

The inclusion of hides and fleeces, boars tusk (mounted in bronze in Hohmichele

VI) and an iron-ore pendant in paramount graves can be interpreted as symbolic representations of tribute given to a paramount by his vassals.

This evidence appears to confirm the predicted material flows that articulate the sub-domains in a hierarchial relationship to the paramount chief. Clearly if the redistribution of wealth objects, possibly together with more basic materials, was the primary responsibility of the Heuneburg paramount to his vassals, then his capacity to do so depended ultimately on his ability to mobilise the necessary resources to maintain specialist craft activity at the centre, to store and redistribute their craft products and foreign prestige goods, and to organise the external flows of the domestic resources of his domain. The paramount's ability to perform these functions seems to have been determined to a considerable extent by the size of his household and its productive capacity to supply craft specialists with foodstuffs and probably to support other 'retainers' attached to his household. There is no evidence that foodstuffs or labour were demanded as tribute nor that the development of powerful chiefdoms in Ha D1 was accompanied by intensification of the agricultural system, either in terms of new crop complexes or new tools. One must conclude, therefore, that a paramount's position depended largely on the size of his household in order to mobilise more labour – and therefore produce – on more land than other households at lower levels of the hierarchy. The large granaries within the fortified Heuneburg settlement (phases IVa 1 and 2) would have been needed to store grain for consumption and seed. A very rough estimate of the size of a paramount's household, in comparison to lesser chiefs, can be gained from the more recent excavations of secondary burials associated with a paramount in a tumulus, viz. at the Magdalenenberg there are well over 100 secondary burials associated with a *Fürsten* grave and dated principally to Ha D1, whilst at Mauenheim, which can be interpreted as a sub-chief level of the Magdalenenberg hierarchy, there were 10 secondaries in each of two tumuli with wagon graves (Spindler, 1971, 1972a, 1973; Wamser, 1972). Figures for other *Fürsten* graves are distorted by poor or partial excavation combined with robbing and destruction of the graves in antiquity. Tumuli belonging to lower categories than these have sometimes survived intact and tend to be associated with an average three to five secondaries so that although the figures are in themselves unreliable, there does seem to be an overall pattern of declining numbers of dependant burials associated with ranking in the political hierarchy. A simple analysis of the surviving secondary burials in the Hohmichele indicates that internal ranking within these descent groups existed (Table 2) in that access to insignia and wealth objects within the group replicates to some extent the ranking found within the domain as a whole.

The hypothesis presented in the model predicted that if access to different sets of prestige goods was regulated and control of their use was the basis for manipulating power relations, then this would be confirmed by evidence of centralised production and the exclusivity of the distribution of such goods in burial and other contexts. Table 1 confirms that Ha D1 wealth goods in the Heuneburg area do divide into such predicted groupings and that different categories of items appear to have been distributed and acquired consistent with the different levels of rank and status. The distribution of these

Table 2 The Hohmichele grave contents

Grave/Rite*	Wagon	Horsetrappings	Bronze vessels	Glass	Coral	Bronze pendant	Gold	Amber	Cloth (other than clothing)	Iron weapon	Bronze belt plaque	Bronze fibula	Bronze ring	Bronze pin	Pottery
VI/inh	×	×	×	×	×	×		×	×	×	×	×			
I/inh	×	×		×			×	×	×		×		×		×
VIII/inh										×	×	×			
XI/cre							×					×			×
XII/cre								×					×		
VII/inh											×		×	×	
IX/cre									?				×		×
II/inh												?	?		×
XIII/cre												×	×		
X/cre													×		×
III/inh												?			
IV/inh															×
V/inh															×

*Inhumation/cremation.

graves (Fig. 1) also shows that persons of the highest rank were part of a dispersed hierarchy and were not 'in residence' at a paramount centre. The Heuneburg paramount formed the centre of a network of political alliances (dependent in terms of his subordinates and equivalent if not competitive with his external partners) that politically integrated a large area of south-western Germany (mainly Baden-Württemberg). The spatial pattern in particular predicts a system of semi-autonomous small chiefdoms (i.e. relatively self-sufficient economically and socially), the heads of which recognise one of their number (at the Heuneburg) as of paramount (i.e. superordinate) status. Since their relationships of superordinacy/subordinancy to each other is determined by success in competitive exchange, access to external trade and size of following, a paramount would effectively be *primus inter pares*, successful only for so long as he is able to dominate the local exchange and redistribution networks through access to more powerful trading partners than subordinate chiefs can acquire.

Hence for a paramount at the Heuneburg, confirming and extending his external trading partnerships is critical for maintaining and enlarging his position. We are therefore presented with two potentially different patterns in the archaeological record. Firstly, burials of dependent chiefs that would contain high status prestige items which can be derived principally from the Heuneburg paramount and his external trading network. Secondly, burials of his exchange partners that might contain gifts from the Heuneburg

paramount, but will also contain other goods – not found within the Heuneburg paramount's domain – indicative of the partner's independent position in the wider exchange system.

In the first case, 'status insignia' act as prestige items circulating within a particular chiefly rank, such that they not only act as symbols of power but access to them forms one of the bases of power of a chief. The model would also predict that these items would circulate from paramount to dependant as part of the total social relations linking the two categories. Hence, it is likely that the Heuneburg paramount would be giving valuables to his dependants through the formation of marriage alliances with them and through feasting, hospitality and other acts of chiefly generosity. His immediate dependants would then, in turn, have the resources to act likewise to their dependants in each sub-chiefdom. They in return would give him local resources and specialities as signs of respect for his authority and in discharge of reciprocal obligations. It would be these commodities (such as the iron, lignite, wool, (?) slaves, etc.) which a paramount would use to exchange with his external trading partners, whilst being saved himself the direct labour of their extraction, exploitation, refining, etc. Instead, the labour of a paramount's immediate dependant group can be used to produce the domestic prestige items to be redistributed, the production of foodstuffs, and the organisation (transport costs mainly) of external trade. As can be envisaged, the labour demand for a paramount is far greater that that of any of his dependants in order to satisfy these requirements and he therefore acts as a prodigious provider for women to produce children and a recruiter of slaves and clients to incorporate into his household as direct producers.

In the second case, a paramount's external trading partners will be selected for their capacity to provide him with necessary prestige goods and raw materials for internal redistribution. We can predict, therefore, that the Heuneburg paramount's relations with his 'outside world' will be governed by the wider regional trade network that he has been able to latch on to. In this case, however, the relation is one of equivalence (although potentially it could and would be seen desirable by both partners to convert it into a dependent relationship and would therefore be competitive in nature). The partnership is likely to be established and maintained by gift exchange and very likely the exchange of women, and would act as the basis on which exchanges of different resources (e.g. Heuneburg tribute for Upper Rhine imports) could be affected.

External relations of the Heuneburg in Ha D1

Initially, eastern contacts were probably dominant, i.e. the copper and salt resources of the Salzburg area in particular, which had supplied large parts of Central Europe with these basic raw materials for a long time. Copper would have been required at the Heuneburg in ever-increasing quantities for the production of high status bronze items, including the large amounts of sheet bronze needed for the manufacture of vessels and for the trimmings of wagon wheels, and possibly bodies. Salt was a commodity of which the acquisition and distribution could easily be controlled by a paramount.

Whereas in south-west Germany one finds in Ha C a localised development from Ha B, in the eastern Hallstatt region, Ha C has been shown to be radically altered through the development of production for exchange and trade with the south. Kossack (1959) has identified and interpreted these changes in Ha C society, using evidence from graves, to emphasise the essentially peripheral nature of south Bavaria in relation to the centres in the Salzach–Enns area, the south-east Alpine area and later the Swabian Alb and further west. In the transition from Ha C to Ha D, it was the demands of the eastern centres for surplus products to use in trade with the south that leads to the development of the western Hallstatt region. But it is clearly the emergence of the possibility of direct access of the western Hallstatt centres to the south that coincides with the eclipse of the development of the eastern Hallstatt region.

As yet, the earliest evidence for the connections between the Hallstatt region and an emergent south-western German centre comes from the Magdalenenburg where the transition from Ha C to Ha D1 shows evidence of material flowing from both the east and – presumably via the Rhine – directly from the south-west. Connections between the Magdalenenburg and the eastern Alpine region are suggested by, the horse trappings in the central burial; the decorated belt plaques (graves 71, 72, 78) which Kilian-Dirlmeier (cited by Spindler, 1973: 13) believes to be related by the type of decoration and its arrangement to Bavarian or Hallstatt parallels, and the double horned fibula in grave 81 of Slovenian origin. The existence of connections with chiefdoms to the west and indirectly with emerging western Mediterranean trading networks is indicated by the presence of an acebuchal type of belt in grave 65 (Spindler, 1973, 1972b). The direction of the exchange by which gold, glass, amber, lignite and copper were obtained can only be surmised. In early Ha D1 it can be suggested that the eastern exchanges were dominant. It was the intervention of the Heuneburg chief in the eastern exchange which enabled him firstly to control the flow of valuables to the Magdalenenburg paramount, secondly to dominate and subordinate the Magdalenenburg paramount; and thirdly to take his place in exchanges with the Upper Rhine centres and thus, indirectly, enter into the *western* Mediterranean network.

In Ha D1, Kossack has argued that the Heuneburg obtained its supplies of amber from further east and the Durnberg is a likely source of copper and salt which were probably both internally redistributed and passed on by the Heuneburg paramount to centres on the Upper Rhine or direct to the south. Riek cites the only parallels for the Homichele glass beads as coming from Bavaria and the Hallstatt cemetery and considers that they were probably made in Etruria and the Po Valley, i.e. reaching the Heuneburg through its eastern exchange partners. The Heuneburg therefore maintained its links with the eastern region but by this period we may be recognising a reversal of the Ha C pattern and the eastern Hallstatt region supplied raw materials in return for wealth items and luxuries coming from the west via the Heuneburg.

Initially, it would seem likely that the Magdelenenburg was the western exchange partner of the Heuneburg chief. The evidence for their connections comes from the fortified settlement at the Kapf. Hübener (1972) has compared the pottery – especially the

large-bellied pots of the painted pottery, on white background – from the settlement with that of Heuneburg phases IVa,b) and from the graves of the Magdalenenburg tumulus where contents include the band-earrings, daggers, belt-plaques and *Tonnen* armbands which are found throughout the Heuneburg domain (Spindler, 1971, 1972a, 1973). This evidence indicates that by Ha D1, the Magdalenenburg was linked to the Heuneburg – and with the exception of some items of costume, like the pins in the women's headgear, used the same insignia of social status and possibly political rank, i.e. daggers, glass, amber and coral beads, etc. It may even be suggested that graves 39 or 67 represent the descendants of the Magdalenenburg paramount who became dependent on the Heuneburg paramount and were buried with some of the insignia of the sub-chief status, i.e. antenna daggers. Through the Magdalenenburg, the Heuneburg gained access to the *Goldgruppe Fürsten* (Driehaus, n.d.: 208). Thus the Heuneburg had established access to the eastern and western exchange partners through a series of intermediary alliances.

The clearest indication of exchange relations between the Heuneburg paramount and the Upper Rhine centres is from the wagon burial at Hügelsheim (Kr. Rastatt). Schiek (1954, 1956) has emphasised the similarities in construction detail of this wagon and those from Vilsingen and Winterlingen. This would indicate the distribution of these centrally manufactured wagons to vassals and external exchange partners. It is suggested that the Upper Rhine centres – of which Kappel (Kr. Lahr), Schlatt (A. Staufen), Ihringen (Kr. Freiburg) and Ensisheim (Arr. Gebweiler, Haute-Rhin) represent other chiefly burials – were independent of the Heuneburg but that reciprocal gift giving and exchange of domestic and imported resources linked them. The trefoil bronze jugs found in Kappel and Vilsingen, and the golden *Kahn* earrings found in Hohmichele XI are indications of these exchanges. The Kappel chamber, like that of Hügelsheim, is said to have been lined with bronze sheet (Schiek, 1954; 156) which is only replicated in the Heuneburg domain in Ha D2 at Giessübel 3, but the strapcrossings are like those found in the Hohmichele VI. The Kappel bronze vessels are thought by Kimmig and Rest (1954) to have reached the Upper Rhine via Marseille and the Rhône route since parallels for the trefoil flagons (shown by Frey (1963) to be of Etruscan manufacture) are found in southern France. The other contents include a finely decorated bronze sheet belt – with eastern Alpine and southern decorative elements according to Kimmig and Rest (1954) – and gold neck and armbands, and a bronze bowl thought to be of local manufacture.

It is unfortunate that the settlement deposits from the Münsterberg in Breisach do not help us on this early Ha D situation. R. Dehn (per. comm.) correlates the Late Ha/Early La Tène level at the Münsterberg with Heuneburg I, and Kimmig's 'Vixien' sherds (1969) are associated with Marnian-like wheel-made pottery and Ionian/Pseudo-Ionian amphorae sherds. Thus, for Ha D2 there is evidence for the southern and western exchange activities for this Upper Rhine centre. Its role during Ha D1 is not yet clear.

There are, however, significant indications of another possible centre for early Ha D at the Britzgyberg, near Illfurth in Upper Alsace. The Britzgyberg has been described by Spindler (1972c) as a *Fürstensitz*. The sondages and excavation carried out between 1967 and 1971 have been briefly published by Schweitzer (1970, 1971, 1973) and Stahl-Weber

Fig. 2 Distribution of *Fürsten* graves in the Upper Rhine Valley.

(1972). The site is an *éperon barré*, in the Largue valley, in a situation that Stahl-Weber (1972) believes would enable the occupants of the site to control the passage between the Rhône and the Rhine. Furthermore, the habitation deposits contain much evidence for bronze-working – an ingot, slag, castings – including rejects – moulds, etc. – iron-working, and weaving. Many finds which are only briefly described would have parallels in the D1 material from the Heuneburg: iron arrow-heads, miniature vessels, serpentiform fibula with disc; pottery situlae, a polychrome vase, etc.

Fig. 2 shows the distribution of the Upper Rhine graves with a wagon (Hügelsheim) and with gold and rich bronze contents (Ensisheim, Ihringen, Schlatt, Sollingen, Kappel). All are thought to be of D1 date by Schiek, except Schlatt (not listed, 1954: *Abb.* 6) and Hatten, which is certainly of a later date since its contents include a beaked flagon (Frey, 1957; Dehn and Frey, 1962). Driehaus (n.d.: 270) dates all these *Fürsten* graves – with the exception of Hatten – to D1 and, following Kimmig (1969) accepts the Breisach Münsterberg as a *Fürstensitz*, but not the dominant centre of this group of *Fürsten* (p. 288). Driehaus (p. 208) believed that the 'Heuneburg group' of *Fürsten* graves was earlier than the *Goldgruppe* of the Upper Rhine which differed in burial rite and who in fact came to dominate. He also suggested that the same social structure would be represented by both groups.

The nature of the distribution of these graves, as seen in Fig. 2, along the Upper Rhine suggests that these chiefdoms may have retained their independence without one being able to dominate the others, although they were certainly involved in exchanges, as indicated by the similarity in the contents of the graves, viz. gold bands, bronze vessels, etc. (Their independence of the Heuneburg paramount is indicated by the different combination of high status insignia, including items not found in the Heuneburg domain, even at the highest level, viz. gold bands.) Exchange therefore took place between equals but a situation probably existed in which there was competition between independent chiefdoms to control access to their own hinterland and continue to attract the external trade partners to direct their economic activity to them rather than to a competing chief. The Heuneburg–Hügelsheim exchange partnership may have been established to counteract the dominance of the *Goldgruppe* centre further to the south. The exceptional Hatten burial may represent a later phase of this more northern centre. As will be discussed below, the status items of the *Goldgruppe*, i.e. gold arm- and neckbands, were to dominate the insignia of highest political rank of the Ha D2 paramount at the Hohenasperg.

To summarise: although rank differentiation had been recognised, e.g. in Bavaria, and expressed in similar categories of status insignia by Kossack (1959), the scale of political development during D1 in the Heuneburg area is of a different order of magnitude. In other words, we appear to be dealing with conditions of expansion in which formerly independent local chiefs become incorporated as dependants of a dominant chief who was able to control their economic activity. This development seems to occur as a result of changes in the external relations of a particular local chief. In terms of his external relations a Heuneburg paramount was able to achieve a dominant position in the local regional economy. Eastern partners would have found it more advantageous to direct their trade through him rather than a number of smaller chiefdoms. He in turn, by controlling a more extended redistribution network, would be able to satisfy the eastern partners' demands as well as act as their intermediary for long-distance trade further to the west – and possibly north – through his Upper Rhine connection. He would be able to perform the same function for his western trade partners. Once these links were established his former equals within the Heuneburg domain would be blocked by his monopoly. They would therefore have no alternative but to depend on him, but this dependence would also have been seen by them to be to their advantage in maintaining local control. In Ha D, the external stimulus for these developments is to be found in the wider connections established with the Greek and Etruscan world.

We know that from an early date (Ha C) relay points for connections between the Rhône, the Alpine passes and the resources of Central Europe were being established along the Upper Rhine. As would be expected, external trade with these Upper Rhine chiefs is reflected in the earliest phase of the paramount's existence at the Heuneburg, e.g. the gold, coral and silk thread and certain bronze vessels in Hohmichele VI and I. Indirectly, the Heuneburg was linked with the Greek enterprises at the mouth of the Rhone and with Etruscan centres in central and northern Italy (Po Valley) (via the Alpine passes and probably the Rhone route too). The intensity of these contacts can be judged by the

degree of acculturation represented by the construction of the mud-brick wall with bastions, and the adoption and adaptation of Mediterranean funerary customs, such as the inclusion of wine-drinking services in graves, by the Heuneburg paramounts. The bossed rim bronze dishes, of Etruscan manufacture, shows an interesting distribution (Dehn, 1965, 1971: *Abb.* 2) centred on southern France, Central Europe (in the 'heart of the Late Hallstatt area' (Dehn, 1971: 84)) and in the south-east Alpine area. Dehn correctly notes that this could be further evidence of the Etruscan use of the Rhône route (as amply demonstrated by Buchero finds of the 7th century BC in southern France noted by Benoit (1965: 51 ff)) or else the use of western or eastern Alpine passes by intermediaries in the exchanges which brought one of these bossed rim dishes into the possession – and eventually the grave – of a Heuneburg paramount (Hohmichele VI).

The development of the western Hallstatt region must be seen therefore as a result of the expansion and competition for trade with their hinterlands by centres in the western Mediterranean leading to the opening of new trade routes and/or intensification of existing contacts. Competition among core centres in the western and central Mediterranean for supplies of raw material and possible slaves would appear therefore to be the determining factor regulating the order of the regional economy. In turn, it would be the differential capacity of local rulers to meet these demands and gain a new access to wealth for their role as relay points in long distance trade which determined local political expansion and growth.

Hallstatt D1–2/3 development at the Heuneburg and the rise of the Hohenasperg

During late Hallstatt D1 there is evidence of two destruction levels in the occupation at the Heuneburg. Following the second, most extensive, destruction phase, the settlement is reoccupied but both the layout and the fortifications show a break in continuity. The open settlement at the Talhau is briefly reoccupied, also showing a break in continuity, and then abandoned. A group of tumuli constructed on the Talhau are interpreted by Gersbach (1969) as the burial ground of the 'new dynasty' now reigning at the Heuneburg. These burials are of Ha D2 and D3 date and can be related to the now dominant Hohenasperg centre. True, the crisis at the Heuneburg, associated with changes in both settlement and burial patterns, coincides with a more general shift in dominance at the local level. In Ha D2–3, in the areas that were previously vassal domains of the Heuneburg paramount, there are no clear indications of the continuation of the D1 political hierarchy. Wagon burials are no longer found in these sub-domains and one cannot detect any significant variation in the grave contents within and between these former vassal domains. As general distributions of D2 and D3 material shows (Fischer, 1967; Zürn, 1952) this does not imply any significant emigration of population from these areas but rather the disappearance of the complex ranking hierarchy reflected in the D1 burials.

The Heuneburg remained occupied throughout the D2/3 phases but as the distribution map of high ranking graves shows (Fig. 3) its area of control has now contracted

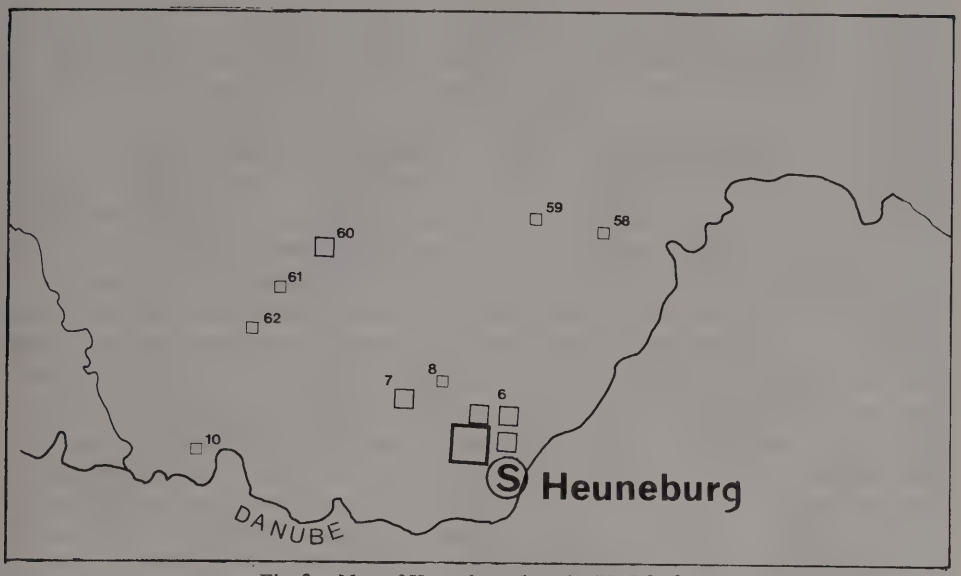

Fig. 3 Map of Heuneburg domain (Ha D2–3).

to the area immediately about the older paramount centre. Control over the former vassal domains has been lost and the authority of such vassal chiefs appears to have been undermined. This would fit one of the lines of development predicted in the model when vassal chiefs no longer able to obtain prestige goods from their paramount to distribute to their dependants would lose control over their domains. The paramount at the Heuneburg appears to have maintained his political independence and the structure of his own sub-domain – as can be seen in the continuity of settlement and the survival of burials of *Fürsten* status in the area during D2/3. However, certain significant changes had occurred. Whereas previously, sub-chiefs were dispersed within the sub-domain, they now appear to concentrate and possibly be resident at the Heuneburg. Evidence for this is in the four Talhau tumuli at the foot of the Heuneburg. All four are generally classified as *Fürsten* graves (e.g. Schiek, 1959) but Tumulus 1 is regarded as exceptional in the wealth of the grave contents and the presence of a wagon and must here be interpreted as the burial place of a paramount, whilst the other three (e.g. Zürn, 1970: 108) correspond to sub-chief status within the ranking hierarchy previously defined. In contrast to these, a number of burials of minor chief status are still found dispersed within the Heuneburg sub-domain, perhaps significantly situated in an arc on its boundaries.

The Talhau burials and the general contraction of the Heuneburg domain in D2/3 can in fact be related to the emerging dominance of a new centre to the north, situated at the Hohenasperg, Asperg. It is significant that the political development of the Hohenasperg area should coincide with the contraction of the Heuneburg domain and the loss of its vassal sub-domains. The development of the Hohenasperg could be linked with

the rupture of external trade relations that characterises the crisis in the Heuneburg domain and would have caused the 'relatively poor grave contents' reported for the primary burials in the Talhau tumuli (Goessler, 1923: 208–18). This crisis in D2 at the Heuneburg also coincides with the penetration of the Hohenasperg domain on to the edge of the Alb and the absorption of some of the peripheral Heuneburg sub-domains. For example, the Burrenhof sub-chief – whose domain was part of the area probably supplying iron to the paramount during Ha D1 – seems to have been one of the few Heuneburg vassal chiefs to maintain this status into Ha D2 with Hohenasperg insignia.

Zürn (1970) has defined the area between the Alb, Schwarzwald, Stromburg and Schurwald, as the Hohenasperg area. As in the case of the Heuneburg area, there is evidence here for continuity in population and burial places, e.g. Hirschlanden, Mühlacker, Deckenpfronn and possibly at the Hohenasperg too. Once again, the majority of settlements were small and dispersed and there are two known – and presumably fortified – hilltop settlements which are at the Hohenasperg (Zürn, 1970: 120) and the Hohennagold, Nagold (Paret, 1933–5b, 1935–8). The Hohenasperg and its surrounding graves has been classified as a *Fürsten* residence by Kimmig (1969). It is unfortunate that the status of this site cannot be confirmed by excavation, since there are reports from both the Hohenasperg and Hohennagold of Ha and Early La Tène sherds.

The Hohenasperg political domain is defined by the distribution of gold-work, coral, jet, glass, amber and sophisticated bronze jewellery often with applied coral or gold. Of these, gold, coral, amber and bronze must have been obtained through external trade. That the collection and distribution of these items was centrally controlled will be shown below. It seems likely that the centralised manufacture of prestige goods and the distribution of foreign wealth objects took place at the paramount's settlement at the Hohenasperg. Zürn (1970) has suggested that gold-working can be attributed to the Hohenasperg settlement on the basis of the quantity found in the area about it.

The graves of the Römerhügel (Ludwigsburg) (Zürn, 1970, with bibliography) and Grafenbühl (Zürn and Herrmann, 1966; Zürn, 1970; Schiek, 1974) attest the highest political status for this period:

1. In contrast to the Heuneburg, the status of these paramounts appears to be more absolute in relation to lesser chiefs, viz. wagon burial is reserved for the highest political status and – with one exception (Bad Cannstatt I) – is not found for lesser chiefs. They also contain gold neck- and armbands. The southern imports – also restricted to paramount graves – appear, e.g. in the Grafenbühl, to be a collection of 'exotica' of different origin and even age and are not representative of any one particular southern centre. They should be viewed as a collection of gifts from a southern power or his intermediaries to satisfy the paramount chief's need for the accoutrements of southern civilisation.

2. Vassal chiefs can be recognised in the burials which share with the paramount graves the inclusion of gold neck- and armbands; they also contain bronze cauldrons: Bad Cannstatt I and II (Paret, 1935, 1935–8; Kimmig and Rest, 1954; Zürn, 1970: 122 ff), Düsslingen (Kr. Tübingen) (Schiek, 1954; Zürn, 1970) and Baisingen (Kr. Horb) (Schiek,

1956; Zürn, 1970) are the graves of the vassals of the three domains of Bad Cannstatt, Düsslingen and Baisingen. In addition, it seems probable that one of the large tumuli in the Mittelstadt area and another in the Vaihingen area would also contain burials of this rank.

3. Within each of the sub-domains, including that of the Hohenasperg paramount, sub-chiefs can be recognised. Their status is defined by a small quantity of gold: usually in the form of earrings, e.g. Schöckingen (Kr. Leonberg) (Paret, 1938–51; Maier, 1962), and the many sites listed by Paret (1935–8: 63–4, note 7), which feature on Fig. 4.

4. In each of the sub-domains another level of the political hierarchy can be recognised below that of the sub-chief: it is characterised by the possession of other items distributed from the centre, such as rich bronze jewellery, often with coral inlay, jet,

Table 3 Scalogram of grave contents of first four ranks in the Hohenasperg domain, Ha D2

Site No.	Burial	Wagon	Southern imports	Bronze vessel	Gold neckring	Gold armring	Gold earrings	Other items – bronze or gold	Amber	Coral	Jet/glass	Bronze neckring	Bronze arm/footring, etc.	Bronze belt plate hook	Bronze fibula	Iron spearhead
5	Grafenbühl	X	X	X	?	?		X	X							
6	Römerhügel	X	X	X	X			X								
8	Bühl			X	?	?										
17	Bad Cannstatt I	X		X	X	X	X	X					X	X	X	
	Bad Cannstatt II			X	X	X	X							X	X	X
38	Dusslingen			X	X	X		X						X		X
36	Baisingen			X	X	X			X				X			
13	Schöckingen*					X	X	X		X		X	X			
11	Hochdorf*						X		X	X		X	X	X	X	X
3	Kleinbottwar						X				X		X	X		X
27	Schlaitdorf						X					X	X			
39	Nehren						X	X								
31	Weil						X						X			
32	Weil						X						X			
29	Rommelsbach						X	X	X							
28	Burrenhof-Erkenntsbrechweiler						X									
25	Neuenhaus						X									
23	Echterdingen						X									X
40	Belsen						X									
30	Waldhausen						X									
14	Hirschlanden 11*								X	X	X	X	X	X	X	
15	Gerlingen 2									X	X		X	X	X	
34	Deckenpfronn 1										X	X	X		X	
9	Osterholz 5											X	X		X	
4	Beihingen												X	X		

*Within the Hohenasperg sub-domain.

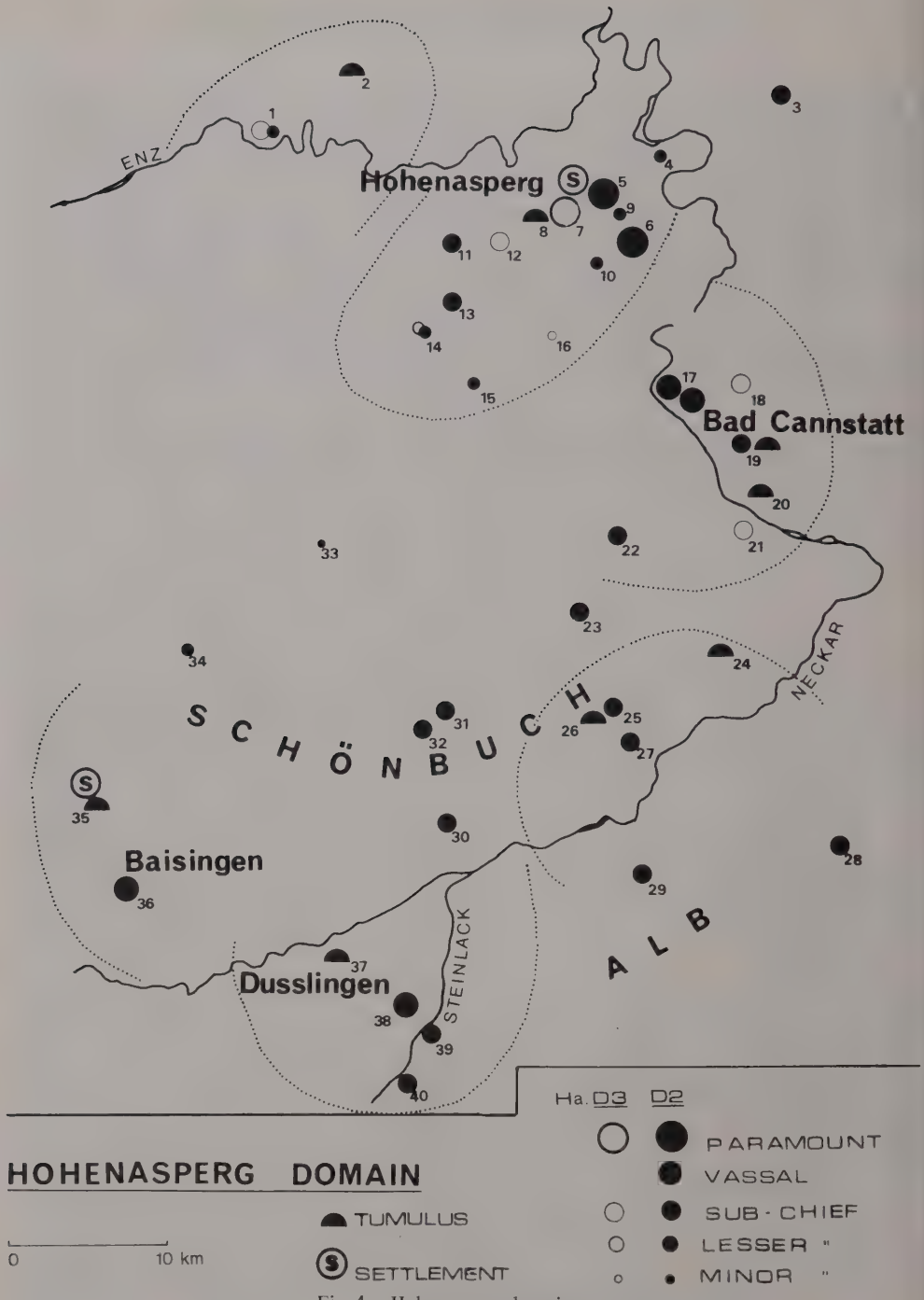

Fig. 4 Hohenasperg domain.

amber and glass beads, e.g. Gerlingen 1 (Kr. Leonberg) (Riek, 1962) and Hirschlanden 7 and 11 (Kr. Leonberg) (Zürn, 1970: 53 ff).

5. Dependants of chiefs at each level of the hierarchy have access to bronze jewellery (rings) often poorly finished: the production of these simple bronze items was probably under the control of the local chief, e.g. Hirschlanden 3. See Table 3 for a table of the graves and their contents.

The sub-domains of the Hohenasperg roughly follow the Neckar and its tributaries, the Ens and the Schmiecha (Fig. 4). The orientation of these domains therefore seems to be strongly influenced by the need to control the river valleys, thus giving a roughly north-south linear distribution. It is also striking that sub-chiefs within the Hohenasperg sub-domain had greater access to goldwork and other prestige goods than would appear to be the case of the other sub-domains during D2. The closer connection between Bad Cannstatt and Hohenasperg can also be seen in the exceptional inclusion of a wagon in a vassal chief's grave.

Lacking evidence of industrial activities from the Hohenasperg settlement, indications of centralised production and tribute collection are more indirect than in the case of the Heuneburg. It is likely that the Düsslingen sub-domain would have been involved in the exploitation of the jet resources indicated by Rochna (1962) in the Balingen area. The iron of the Alb was probably exploited in the Urach area – as in D1 – and possibly passed directly to the Hohenasperg: this would have been the economic basis to the political survival of the Burrenhof sub-chief. Furthermore, stock-rearing can be suggested for the highlands of the Schönbuch; this would have supplied the paramount with hides and fleeces. There is evidence for the production of high status cloth from the Grafenbühl (central chamber) (Zürn, 1970) where cloth with gold thread was found.

Certain industrial activities can be suggested as having been under the Hohenasperg paramount's control, and hence carried out at the Hohenasperg. Both Paret (1935) and Schiek (1956: 133) believe that the wagons of Ludwigsburg and Bad Cannstatt I (Schiek's Type B) came from the same workshop. The complexity of the bronze and iron working and the similarities between the two suggest that this workshop would have had to be part of a larger complex of metal and woodworking facilities. The evidence for high status cloth suggests that certain cloth production would also have been carried out by craftsmen at the paramount's centre. The use of coral, amber and gold in small quantities as inlay or as application to simpler bronze types, e.g. pins and fibulae, implies centralised production of the basic types in workshops where these foreign materials were available and worked into larger items. This would be supported by the marked similarities in the neck- and armbands and also the fact that the same techniques were used in the working of the amber and coral found throughout the domain. Both copper and tin would have had to be obtained through external exchanges and the manufacture of bronze vessels, neck-rings, fibulae and belt plaques would have been centralised whilst the manufacture of simpler items, such as plain bronze rings, could have been under local chief's control. The working of iron may have been centrally controlled, since Zürn notes that the ores were not generally available throughout the Hohenasperg area.

The stylistic evidence and the limited range of the gold types indicate that the gold found within the domain was being worked at and distributed from a single centre, which is assumed to be the Hohenasperg. Similar techniques were used on jet, amber and coral and similarities in the items produced in gold and these other materials suggest a common centre of manufacture. Gold was also used in small quantities as applications to more base metals (silver and bronze) and amber and coral were used to embellish simple bronze items. Gold was particularly important in denoting political status and the access to and control of this commodity must have been one of the bases of the Hohenasperg paramounts' authority. Hartman (1970) has shown that the gold found in Ha D2 contexts is not Rhine gold, but was obtained from more distant sources that were being widely traded in Central Europe at this time (as in Ha D1 and Urnfield times). Hartman has shown the analyses of the gold of the Hohenasperg paramounts' graves and all the other gold-rich graves of Ha D2 (including Talhau 1, 2, 3, 4) to be of one type. A second type of gold is represented in a few graves of this period. But both types are represented in the Upper Rhine area, e.g. at Kappel. This indicates that the Hohenasperg access to gold was through the Upper Rhine centres. Rochna (1962) has suggested that gold was exchanged for jet between the Hohenasperg and Upper Rhine centres in this period.

Exchange relations clearly existed between the Hohenasperg paramounts and the Upper Rhine chiefs. Exchanges in gold, jet, probably amber and glass would have been facilitated by reciprocal exchanges between the chiefs; these exchanges are reflected in the assortment of Mediterranean exotica found in the Grafenbühl. The Römerhügel contains a shallow bronze dish with handles like one found in Hatten (Frey, 1957). The only other parallel is from a grave in southern Bohemia (Dehn, 1971). Dehn (1971) believes that they are the products of a south-east Alpine or northern Italian workshop, but what is significant here is that their distribution implies connections between the eastern Alpine area and the Upper Rhône, as well as an Upper Rhine–Hohenasperg link. Schiek (1956: 78) notes that the best parallels for the large, hollow-headed gold pins from Schöckingen are found in Switzerland, but that the graves of Ihringen and Gundlingen were reported to have contained similar pins.

The extension westwards of the Upper Rhine exchange relations is suggested by the 'Vixien' material from the Münsterberg, Breisach (Kimmig, 1969). A possible intermediary in exchanges between the Upper Rhine and the coastal region near Marseille is the site of Camp de Chateau, Salins (Jura), where a variety of Lower Rhône and even Phocaean wares are found (Dayet, 1967). This would also be a likely route for the trade in gold which possibly came from Iberia.

The exchange relations between the Hohenasperg and Heuneburg are clearly shown by the burials in the Talhau tumuli which contain the gold neck- and armbands which are such important elements of rank insignia in the Hohenasperg domain. The four pins with decorated amber heads found in Talhau I, 4 and Hochdorf (Kr. Vaihingen) (e.g. Paret, 1935–8) are so alike, according to Schiek (1956: 79), that he regards them as products of a single workshop. Furthermore, Schiek cites the only small-headed pins found in *Fürsten* graves as coming from Talhau I, 4, Talhau III and Ludwigsburg, secondary burial no. 5.

Presumably, these would have been passed on to high-ranking lineage members by the exchange partners. There are no southern imports in the Talhau burials (although Black Figure wares and southern amphorae sherds, etc., are known from the settlement). Since the Heuneburg chiefs appear to be subordinate to the dominant Hohenasperg paramount, it would be unlikely that the latter would have derived his southern imports and other foreign materials through the Heuneburg, but both would have been involved (as described above) in exchange alliances with the Upper Rhine centres. The Heuneburg chief may have maintained his alliances with the east which would have enabled him to maintain his own sub-domain and establish himself high in the Hohenasperg ranking, and also facilitate exchanges with the Upper Rhine for the southern produce – not necessarily of high status – like wine which was consumed in his settlement.

As found in Ha D2 in the Heuneburg area, the authority of the Hohenasperg paramounts was to be undermined and his domain limited to what was formerly his subdomain. The last of the paramount burials at the Hohenasperg, the Kleinaspergle, contains a combination of imported bronze vessels, gold ornaments, vases and other items which are clearly Early La Tène (or Ha D3) in date and represent a realignment of the external connections of the Hohenasperg paramount (Paret, 1935–8; Schaaff, 1969; Zürn, 1970: 118 with references). Other graves within the reduced domain confirm the continuing redistributive role of the paramount, e.g. secondary burials within the Römerhügel and Grafenbühl, also Hirschlanden Grave 13, Sirnau (Paret, 1935–8; Zürn, 1970) and others.

The open circles on Fig. 4 show the reduced Hohenasperg domain during D3/Early La Tène. The most notable examples of the paramount's new contacts are the Kleinaspergle grave contents and the evidence of his stela there, and the carved Hirschlanden figure from within his domain (e.g. Kimmig, 1965; Zürn, 1965, 1970; Beck, 1974).

Jet provides most evidence of the external relations of the Hohenasperg paramounts. As Rochna (1962: 62) points out, jet beads are found in greatest frequency in the southern and central Württemberg area, and their distribution extends through the Lower Rhine area to near Lake Constance. During Ha D3 (Early La Tène), there are further indications of the paramount's links with the emergence of the dominant Middle Rhine chiefdoms in the large lignite armrings found in the Kleinaspergle and the grave of Reinheim (Kr. St Ingbert) (Keller, 1965). Furthermore, there is another ring of this type found in grave 44 of the Durrnberg, near Hallein. This indication of the continued exchanges – now probably indirect – between the dominant paramount in south-western Germany and the chiefs of the Salzberg area is supported by Schwappach's (1973) evidence for the combination of 'western' and 'eastern' stylistic elements in Early La Tène ornamentation. Exchanges in salt, copper, tin and amber would have been other material bases of these alliances.

Notes on developments in Early La Tène

We can only make certain suggestions as to the causes of the regional shift of

dominance that occurs in Early La Tène from the Upper Rhine and south-western Germany to the Middle Rhine centres.

Unlike the relative decline of particular centres such as the Heuneburg or the Hohenasperg, a regional shift in dominance represents a major dislocation in the wider regional system. It is necessary therefore to move from a concentration on the local situation in Central Europe to changes in other parts of the regional system which set the conditions for such realignments to take place. A delicate balance of interests and alliance formed the basis for the relatively fragile existence of the Greeks in the western Mediterranean, the success of which is witnessed by the fact that Marsalia and other Greek or Hellenised populations in southern France and the mouth of the Rhône achieved a peak of dominance and expansion in the late 6th century BC. However, increasing competition between Greeks and Etruscans for control over trade in the western Mediterranean becomes a consistent feature in the later 6th century BC. The documented decline in the flow of imports into Massalia towards the end of the 6th century; the contemporary increase in Etruscan wares coming via the Alpine routes into Central Europe and bypassing the Rhône; the expanded role of Greek trading colonies in Adria and Spina and the expansion of Greek trading contacts at the head of the Adriatic serve to indicate a decline in Greek economic activity in the western Mediterranean in the face of competition with Etruscan and Carthaginian interests. This shift in economic power must form the context for understanding the shift of focus in Central European trading networks from the Rhine–Rhône route to an increased dependence on the Alpine passes and access to trading populations in northern Italy and at the head of the Adriatic. It can be suggested that since traditional centres in the western Hallstatt region would be heavily connected in east–west trading alignments oriented to these traditional outlets, there would be a marked incentive for specialist trading populations controlling the western Alpine passes to attempt to bypass centres on the Upper Rhine and establish new alliances with local rulers that until then had not been directly but only peripherally integrated into the southern trade via the western Hallstatt region. One such area was the Neuweider Basin, where the Lahn and the Mosel flow into the Middle Rhine. One of the centres on the Middle Rhine at Kärlich has the largest number of situlae of Tessin origin and of the six isolated vehicle burials some are likely to be late Hallstatt in date. Along the Hunsruck and penetrating the Eifel and the Taunus, situlae and wagons of the same date are found to be widely distributed. It is possible that Kärlich initially acted as a relay point for internal exchange between independent chiefs based in areas rich in iron and copper. During late Ha D–Early La Tène, Kärlich appears to dominate in these exchanges and it is significant that wagons, as high status indicators, are no longer found in areas where Tessin situlae are distributed, except at Kärlich. The likelihood that the Rhine–Mosel area had by now become integrated into a single political domain centred on Kärlich would be supported by the uniformity of the pottery and bronze jewellery recognised in the area. There seems little doubt that this dominance depended on the position of Kärlich on the Rhine and its control over imports of situlae brought in or locally manufactured by Tessin and the Golasecca traders. Driehaus has convincingly shown the

Fig. 5 Early La Tène on the Middle Rhine.

importance of control over the rich iron ores in the Hunsruck and parts of the Eifel–Taunus region in Early La Tène. He has tried to relate the location of rich graves to these deposits and has postulated the immigration of 'iron lords' to account for political developments in this area. By redefining the graves into more consistent categories, one finds that far from being located near the iron sources in the Hunsruck, the true para-

mounts are positioned for trade on the Rhine (Fig. 5). This interpretation would see the redistribution of luxury imports in the Hunsruck coming through a filter of paramounts controlling access to the Rhine. It would also explain why it is in these chiefly burials that, in addition to the goldwork, one finds the exceptional imports of this period, e.g. sets of Etruscan basins at Dorth, the pilgrim flask, strainer handle and the Attic *Kantheros* at Rodenbach; and later the Campanian bucket at Waldalgesheim. In contrast to these, only one exceptional bronze amphora import has been found within the Hochwald–Nahe area. As far as one can tell from primarily status items in burials, one of the important categories of import being circulated by paramounts to their dependants on the Hunsruck are the Etruscan beaked flagons and occasionally other Etruscan bronzes or specialised goldwork. In return, it seems that iron, copper and possibly salt were sent back to the Rhine as tribute. It would also seem reasonable to suggest that typical features of Early La Tène culture, such as the use of two-wheeled chariots as status indicators and the use of carved stelae as grave markers can best be interpreted as part of an Etruscanising influence that would serve to culturally identify paramounts with their external trading patrons.

The attraction of Central Europe for the city states and colonies of the Mediterranean is indicated in the increasingly antagonistic relations between the latter for the control of access to its resources. The economic rationale is clearly represented by the different values attached to imports/exports by local paramounts and external specialist traders. Local resources such as iron, copper, salt, wool, hides, graphite and possibly slaves were due to paramounts as tribute and had value only to the extent they could be used in exchange for luxuries and status items, which would extend and help confirm political control To the external specialist traders such low-cost manufactured items or discarded exotica of the classical world were a low price to pay for the primary raw materials that could be obtained in return and sold for high profits in home markets.

As mentioned earlier, partners in peripheral areas are unlikely to endanger the regional economy as a whole. It would be partners or disturbances in the main centres of the Mediterranean world that would most radically affect all parts of the system. The mid to late 5th century BC is a period of more intense competition, antagonism and warfare among the core Mediterranean states which, in terms of the northward expansion of Rome, the contraction of Cartheginian influence in the western Mediterranean in face of the competition from Magna Graecia, and a culminating disaster in the Pelopponesian War, appear better understood as regional aspects of more basic failures in the political and economic systems of the Mediterranean world.

Regardless of the causes, it is true to say that this disruption of economic and political control must have rapidly undermined the bases of the political expansion of Central Europe in Ha D/Early La Tène. The fragile political structures made possible by their dependence on the Mediterranean world would, we suggest, have been rapidly undermined by these events in the latter area. It is significant that what has been taken as one further disaster, the movement of Celtic populations into the southern fringes of the Mediterranean Basin, occurs subsequent to these crises of the later 5th century BC. It can

be argued that these movements are directly attributable to the preceding failure of the core centres to maintain stability of the regional systems that had evolved by the mid and late 5th centuries BC. This implies that movements of Central European populations into northern Italy and elsewhere may not be a coincidence or due to opportunistic advantage taking of weakened power structures in the Mediterranean, but a result of the collapse of the political system in the periphery that the Mediterranean city states had at first stimulated and subsequently left at risk.

Conclusion

We have attempted, in this paper, to explain certain internal features of the political units that existed in south-western Germany in Ha D/Early La Tène. In addition, we have seen that the development of these societies, although weak in comparison with contemporary Mediterranean civilisations, was dependent in a very significant manner on the latter. Moreover, the political structures that developed in south-western Germany (and in other areas at this and earlier periods, where societies are found in similar structural positions) was of a form that provided particular advantages to external trading partners seeking supplies of raw materials and perhaps slaves. We would argue, therefore, that the particular form that these tribal societies took was directly determined by their role serving as one specialised sector within a larger geographical division of labour centred on the Mediterranean world. This argument would be in accordance with a similar phenomenon of dependent development noticed for later historical periods (e.g. Frank, 1969; Wallerstein, 1974) and more specific ethnographically documented situations where prestige-goods systems have evolved on the periphery of highly centralised states as a structural precondition for the further evolution and development of the latter (e.g. Ekholm, 1972; Dupré, 1973).

It might be argued that this represents a unique historical incident peculiar to the particular conditions of urban development in the Mediterranean world in the first millennium. On the contrary, we would argue that they represent an instance of a more generalised phenomenon that had occurred at earlier and later periods in prehistory as well as being documented in the 'ethnographic present'. As such, this argument encourages neither diffusionist nor trade hypotheses as an explanation but rather suggests a more worthwhile focus on the structural development of local 'societies' through the role they play in a larger spatial and temporal units of reproduction (e.g. Friedman, 1976). It would be insufficient, therefore, to see such peripheral 'tribal' societies as independent phenomena linked to such states through the mechanisms of trade. Trade does of course take place but its form and direction and the transfer of value involved is determined by the structural relationship which exists between local social systems that are materially connected in this way. The differential development of such systems and their dependence on each other for their own local evolution determines the nature of the kind of interaction that occurs between them. It must be obvious therefore that we will be unable

to understand what form this will take until we have a clear understanding of the internal structure of such local societies and, in our particular case, the nature of the more dominant systems at the centre and the forces that drive them to expand against each other and transform less developed societies on their peripheries as a necessary correlate for their evolution. It is in this sense that 'trade' as such is epiphenomenal, when considered before the former task is completed.

Abstract

The paper presents a reinterpretation of the political and economic structure of Early Iron Age society in south-western Germany. The available data has been reorganised and reinterpreted utilising concepts derived from anthropological theories on exchange in particular the political significance of control over prestige items needed in social transactions. In addition, stress is laid on the relationship of such structures to larger and more centralised states and their dependence on each other for further development.

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Possible evidence of the parasitisation of early Mexican communities by the micro-organism *Treponema*

by DON BROTHWELL

Introduction

The question of the origin and spread of the disease group collectively referred to as the treponematoses, which includes venereal syphilis, has without doubt produced more scientific and popular interest than any other group of diseases. Opinions as to the micro-evolution of these diseases – pinta, yaws, endemic and venereal syphilis – vary considerably. In particular, syphilis has been considered to be both a disease of New World origin (transmitted elsewhere with early European contacts), or alternatively of Old World origin. It is not the purpose of this study to review the very extensive literature, but to place on record some of the evidence of skeletal abnormality from Mexican sites which suggest a Pre-Columbian antiquity to some form of bone-changing treponemal disease in Central America. It is important to try to see this not simply as a part of the history of specific micro-organisms, but rather as a very interesting facet of the human ecology of earlier communities. The treponematoses may well have a long history, and their 'success' in relation to man may be the result of their ability to adapt to varying climates, varying population densities, the changing gene pool composition of some earlier human societies, and also the variation in standards of hygiene attained by different cultures. The study of the treponematoses can therefore only be fully appreciated in relation to the ecology and cultural history of earlier man. Similarly, one can argue that a full and balanced assessment of earlier human societies must include consideration of their health status.

It seems to me that Mexican skeletal material has a very special contribution to make in this field. What follows is a description of the material which, on the criteria set out by Hackett (1976), indicates some form of treponematosis in various Mexican populations through time. I wish to note here that some of the material I have examined has already received comment from Goff (1967), Anderson (1967) and Davalos (1964). The value of this note is that theirs and other material has been seen by me and therefore degrees of bone change and their description have some degree of standardisation. This

work would not have been possible without the full co-operation of the Mexican National Museum of Anthropology, and particularly the enthusiastic support of Professor Arturo Romano.

Materials and methods

The skeletal remains were all part of the collection of the National Museum of Mexico. The pathological material to be discussed was sorted out from a much larger collection of palaeopathological specimens available in the museum. Because of the very large numbers of Amerindian specimens excavated, it was not possible to establish frequencies of treponemal pathology relative to overall site samples. The following samples were available for special study:

(a) Cueva de la Candelaria, Coahuila, *c.* AD 900–1200.
(b) Tehuacan, Puebla, *c.* 900–200 BC.
(c) Pedregal de San Angel, D.F., *c.* AD 500–800.
(d) Xochicalco, Morelos, Classic Period.
(e) Cueva de la Cecilia Trigo Moreno, *c.* AD 900–1200.
(f) Tancol, Tamaulipas, Post-Classic.
(g) Churubusco, Post-Classic.
(h) Pedregal San Angel, Post-Classic.
(i) Tula, Aztec (Post-Classic).
(j) Tlatelolco, Post-Classic.

Advice on the dating of the specimens was kindly provided by colleagues in the National Museum. All specimens which displayed pathology which might possibly indicate treponemal disease were set aside for detailed study. Only lesions which are considered to show the diagnostic criteria of treponematosis as set out by Hackett (1976) are included here. Obviously, there was much variation, from 'clustered pits' to late stage 'radial scars' (see Hackett, Fig. B, p. 367) and eventual 'caries sicca' (his Fig. C, p. 378). Where possible, I have attempted to describe the bone changes in general terms, using the more specialised nomenclature only to relate an area of bone change specifically to Hackett's scheme.

It will be seen from the list of sites above that the time range could extend from as early as 900 BC through in fact to European contact times, a span of nearly 2,500 years. In considering the lesions it is important to keep in mind the fact that *Treponema* clearly had a long parasitic relationship with some earlier Amerindian populations. In terms of spacial distribution, it will be seen in Fig. 1 that the human groups are established in varying environments (in terms of altitude, humidity, etc.) but appear not to occupy the more southern tropical zone of the country.

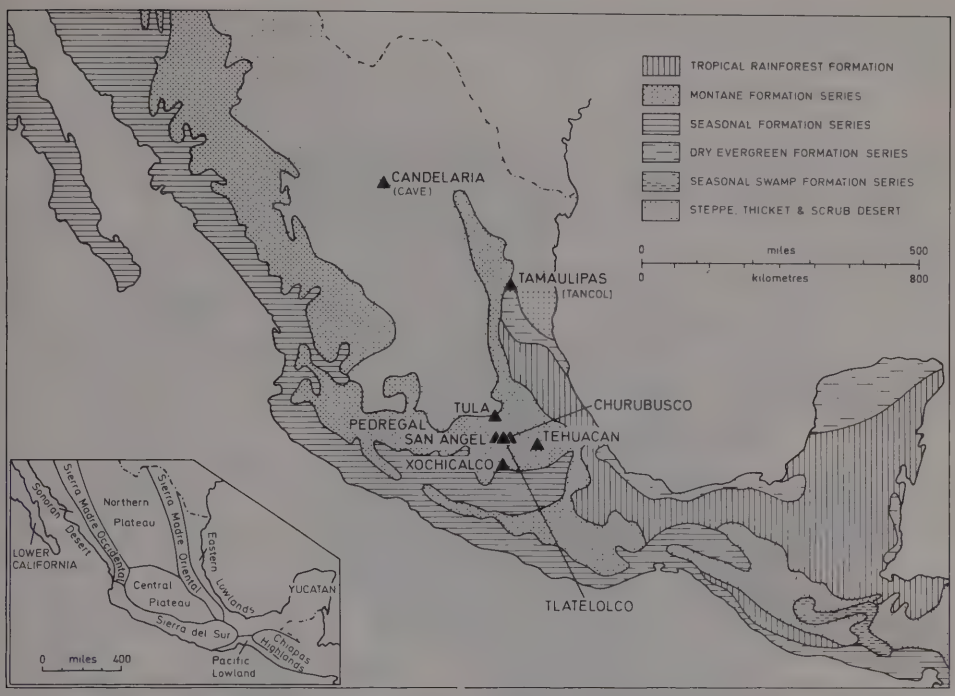

Fig. 1 Eight areas of Mexico from which there is strong evidence for treponematosis in the past, superimposed on a natural vegetation map and compared with the main physical features of the region.

The evidence for treponematosis

A. Material from the Cueva de la Candelaria

By far the most numerous evidence so far is from this site in the northern state of Coahuila. Goff (1967) records that over 20 skulls and nearly 100 long bones show pathological changes, but in fact a smaller number show lesions particularly suggestive of treponemal infection. As in so many cave samples involving multiple human burials, the dating of individual specimens is not easy, and on available evidence it would be best to regard the material as Pre-Columbian, but possibly extending over a few hundred years.

Skull number 12. A young adult female with no evidence of dental caries or other oral pathology before death. Three separate areas of osteitis are present on the cranial vault, and that in the frontal area extends down on to the nasal bridge.

(a) Lesion near the left asterion of approximately 33 mm in length. This is in the form of shallow and irregular cratering, and extends mainly on the parietal, although there is a slight extension over the lambdoid suture on to the occipital. No perforation through to the endocranial surface occurs.

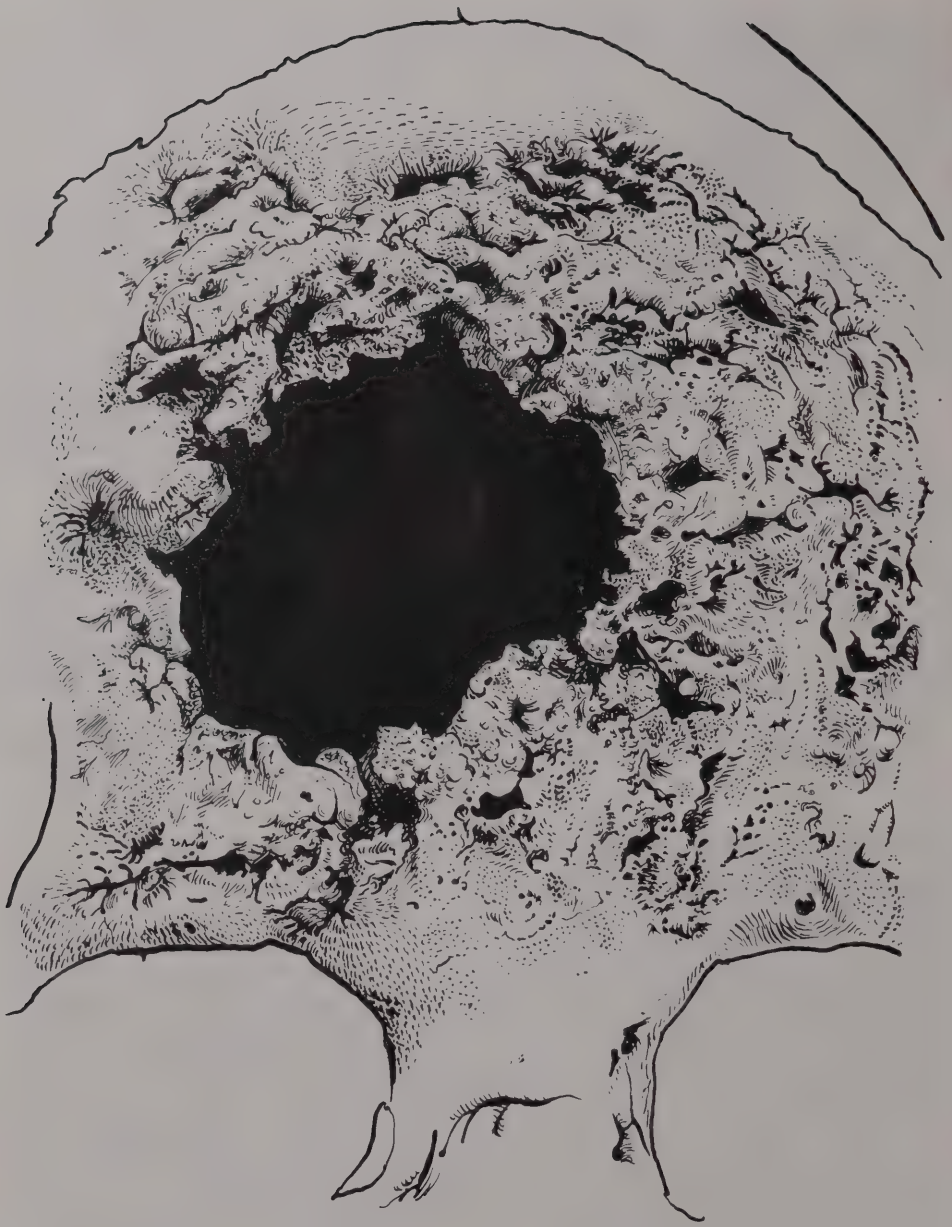

Plate I Frontal region of skull 12 from Cueva de la Candelaria, showing the massive osteitis and cranial destruction. Drawing by Rosemary Powers.

(b) Lesion is situated on the right parietal only, extending as a half-moon shape from the lambdoid suture towards the parietal bossing. Again, the inflammatory reaction is relatively superficial over most of the affected area, but in the middle zone there is a small perforation about 17 mm in length through the inner table.

(c) The frontal osteitis is by far the most extensive area of inflammation, with a maximum breadth of 95 mm (Plate I). Much of the frontal bone is affected, and the infection spreads just slightly into the upper zone of the orbits and laterally down as far as the malarfrontal suture. The nasal bones are affected, and there is a 'saddle' deformity just below nasion. Extending over much of the right orbit is a large perforation through to the endocranial surface. The maximum width of this lesion is 47 mm, the sides of the hole being irregular and clearly linked with the destructive inflammatory process. On the endocranial aspect, the osteitis extends in parts by as much as 20 mm from the large external perforation. Similarly, at the right parietal it extends by a similar amount on the endocranial surface.

From the bone changes described it is clear that a long-standing osteitis of a treponemal kind seems most likely to have produced these changes. The lesions on the external surface showed both highly irregular bone as well as smoother 'scarring' – suggestive of a process of inflammation and repair reaching the state defined as caries sicca by Hackett (1976).

Skull number 11a. This may also be a young adult female, again with no obvious oral pathology. The skull is in an excellent state of preservation, so that the two zones of bone destruction are clearly the result of ante-mortem changes. The osteitic reactions are both in the frontal area, and may be described as follows.

(a) The lowest lesion is in the region of the right frontal bossing. It is represented by osteitic pitting and superficial cavitation to a mild degree, extending to about 24 mm (Plate II).

(b) There is a second and large area of inflammation in the region of bregma, extending backwards on to the parietals by up to 10 mm, and forwards over the frontal by about another 60 mm. In width, the osteitic area extends over about 57 mm at a maximum. This area of bone change and destruction may well have started as more than one discrete zone of reaction, but is now an irregular joined massive reaction. The degree of reaction is such that it affects the inner table but does not perforate through on to the endocranial surface, a condition perhaps best referred to as early circumvallate cavitation (Hackett, 1976).

In view of the nature of this evidence the lesions seem most likely to indicate treponematosis.

Skull number 11b. Probably the skull of a middle-aged adult male, showing considerable oral pathology and tooth loss.

Over most of the frontal bone, from the upper margins of the orbits to the area of the temporal lines, is a severe reaction likely to be the result of a long-standing inflammatory condition. Minor bone changes are also to be seen extending over the coronal suture for about 12 mm and the infection similarly extends down on to the left greater

Plate II Cueva de la Candelaria, skull 11a. Lesions in the frontal area.

sphenoid wing. The osteitis was clearly of long standing and has produced deep changes into the diploic area, and to a more restricted degree into the inner table. Indeed, the endocranial surface in this area also displays a mild reaction. Again, the frontal zone shows areas of apparent bone reconstruction as well as zones of destructive osteitis, indicative of the circumvallate cavitation stage.

Skull number 7. A robust male of probably early middle age. There is some tooth loss and other oral pathology.

There are at least four areas showing bone change; three being frontal and one in the right facial area.

(a) On the upper left superorbital zone, near the fronto-malar suture, is a small rounded crater about 5 mm in diameter. The surface is relatively smooth and appears to be totally healed.

(b) Just to the right of the median plane, and just above the supra-orbital region, is a shallow elliptical lesion showing nearly complete healing. In maximum length it is in the region of 22 mm.

(c) To the lateral margin of the right supraorbital zone, is a deeper slightly irregular crater of about 21 mm in maximum length. Again there is evidence of considerable healing.

(d) The fourth lesion is represented by only slight irregularity on the right malar bone, extending for about 13 mm. Again, the bone appearance strongly suggests that some destruction and consequent healing took place.

Skulls of this kind, showing multiple healed cratering or radial scars present considerable problems in interpretation, and yet it seems unwise not to make comment about

them in relation to treponemal disease. There is clear evidence from recent cases that treponematosis can produce discrete cratering (see, for example, Fig. 5 in Hackett, 1976). In an individual with resistance to treponemal infection of bone, restricted shallow cratering rather than extensive vault osteitis would occur. In view of other cases of a similar kind which have been found in Amerindian series, it seems important to establish that even shallow radial scars (especially if multiple) may indicate treponeme activity. Clearly there is a need to be especially cautious, but it may be significant that male number 7 showed healed craters in areas where treponemal lesions often occur, and was a member of a community in which at least three other individuals show evidence of a severe destructive osteitis likely to indicate the presence in the community of some form of infection of a treponemal kind.

Long bone pathology from Cueva de la Candelaria

As in the case of the skull pathology, noticeable abnormality, including possible treponemal osteitis, has been separated from the normal specimens. It is of course very unfortunate that owing to disturbances in the past there is no hope of associating any of the post-cranial lesions with those of the skulls. As there appears to be more 'overlap' in long bone osteitis caused by different micro-organisms, the diagnosis of treponemal changes in bones other than the skull must remain highly tentative, at least until further studies provide a greater degree of confidence in diagnosis. However, I would agree with Goff (1967) in considering that some of the post-cranial bone changes probably indicate treponematosis.

Of the post-cranial remains considered to show possible evidence of treponemal changes, all were long bones. These may be considered separately as follows:

Number 18. The right tibia possibly of an adult male. There is a slight irregularity at the proximal end of the medial articular surface. All the mid-shaft area (about 190 mm in length) is swollen and to some extent irregular. The medial face of the shaft is particularly striated and pitted. The lateral and posterior aspects show noticeable vascular grooving. This is a long standing osteitis which has severely affected the cortex and medullary cavity.

Number 23. The left tibia, again possibly of a male. Much of the shaft is involved in a patchy and destructive osteitis. Although there are some layers of new bone, four restricted zones show nodes with cavitation (two in the central shaft region and two distally).

Number 16. This right tibia may belong to the same individual numbered 23. At least the tibial shaft displays nearly identical changes, both in terms of general changes to the cortical bone and zones of destructive inflammation.

Number 21. ? Male left tibia. Considerable osteitic swelling of the shaft in the proximal half. There is irregularity especially on the posterior aspect. Some bone reorganisation and healing appears to be occurring to some extent.

Number 1. Right humerus possibly of a male. There is a well-healed fracture in the upper half of the shaft. In the distal half there is considerable expansion of the shaft (Plate III), with a number of distinct areas of cavitation. The infection extends to the distal joint but does not involve it (although there are arthropathic changes quite independent of the osteitis).

Number 19. The left tibia of an adult of uncertain sex. The shaft is generally swollen except for the posterior aspect. There also appears to be slight bowing, which may be accentuated by the anterior expansion. A section has been cut through the anterior swelling and reveals a thickening of the shaft cortex but a reduction in bone density.

Number IZQ. The left tibia of an adult of uncertain sex. Four independent areas of swelling were noted, although they now somewhat merge into one another extending over much of the shaft. Three of the zones clearly show that there was an active osteitis at death. However, the main anterior shaft swelling is smoother and may well be in the process of healing.

Numbers 5 and 8. These are a humerus (8) and ulna (5) of a young infant of under one year old. Areas of light, spongy new bone are to be seen at the proximal end of the ulna and along much of the humerus shaft. Although it may obviously be debated as to whether another disease was responsible for these changes, nevertheless the possibility must be considered as to whether these bone changes are the result of treponematosis.

Considering the long bone pathology together, although it is limited in amount, the lesions are of a kind and extent which could well have occurred in individuals with the degree of treponematosis seen in the skulls described. It is significant that the bones were long bones and especially tibiae, and that the changes were in the form of new bone, expansion of the cortical tissue extending to node formation and cavitation – but also with bone reorganisation and healing.

A tentative general conclusion which can be reached from these remains, both of the skulls and post-cranial skeleton, is that the Candelaria community was infected with a form of treponematosis. This condition produced severe degrees of bone change, but the lesions appear to have had restricted extent in the skull and skeleton generally. There is evidence that the disease did not produce an entirely progressive destructive sequence of change, and that degrees of healing also occurred. One can therefore question whether the community may have been acquainted with the disease for some generations, with consequent decline in its virulence.

B. Tehuacan. The earliest evidence from Mexico

TS 218. Burial 2. Zone C. Level 4. Santa Maria Phase *c.* 900–200 BC. This robust adult male has already been described and discussed by Anderson (1967), who concludes that the cranial vault pathology is 'typical of a treponemal infection' (p. 99). Except for oral pathology in the form of caries, abscesses and tooth loss, there is no other pathology in the facial area. However, the cranial vault displays a widespread destructive osteitis

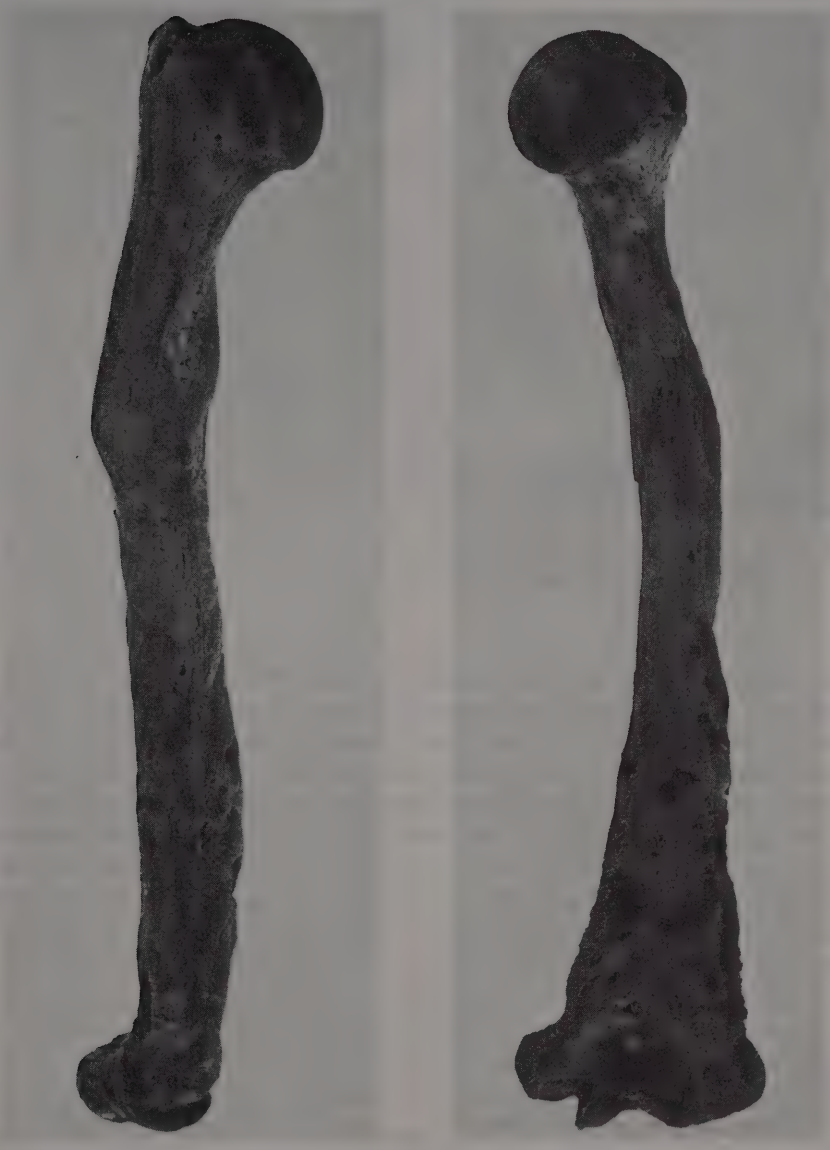

Plate III Right Humerus No. 1 from Cueva de la Candelaria, showing two views.

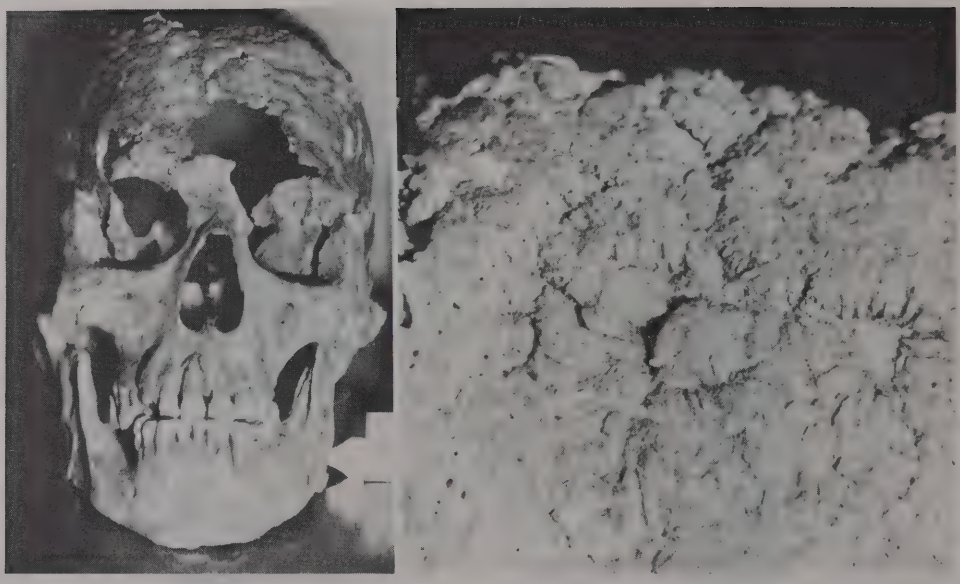

Plate IV Cranial pathology in the Tehuacan specimen TS218 from the Santa Maria Phase (*c.* 900–200 BC). General view and close-up.

which extends even on to the occipital and the temporal bones. As well as seven or eight active areas of inflammation, there appears to be some 'healing' and stellate scarring. In Hackett's (1976) scheme of changes, the Tehuacan skull displayed at least nodular cavitation (Plate IV). Owing to post-mortem damage to the top of the vault, it was possible to note that endocranial changes were occurring but not by any means to the same destructive degree as seen on the outer table. This skull is of great importance in demonstrating beyond reasonable doubt that a disease producing cranial changes suggestive of a treponematosis was established well before European contact with the Americas. Most of the other examples giving support to the occurrence of such a disease are in fact of Post-Classic date (*c.* AD 900–1520), although there are one or two exceptions.

C. Pedregal de San Angel, D.F.

Db. 2-45. This adult male not only shows a zone of osteoporitic pitting medially, but in the regions of the parietal bosses are smooth multiple craters. Although now well healed, these should perhaps be considered as possible evidence of old treponemal cratering. Davalos (1964) has already called attention to these 'pequenas zonas de necrosis'. Of Classic date (AD 500–800).

D. Xochicalco (Morelos)

Db. 1-11. Another skeleton considered to be of Classic date. This is an adult female with tibiae showing severe sabre deformity associated with noticeable osteitis on one side, and less on the other. Davalos (1964) suggests rickets as an alternative to deformity from treponematosis, but this seems less likely.

E. Cueva de la Cecilia Trigo Moreno

Skull A. A robust adult male of Post-Classic date (*c.* 9th to 12th centuries). Healed lesions are present on the frontal and again raise the whole question of the correctness of excluding healed pathology in population morbidity surveys. To me it seems highly relevant to include all possible evidence of a disease in a community, even if some of the information is open to some doubt and alternative explanations. In this case it seems likely that eight distinct zones of reaction had originally been present, mainly clustered in the central region of the frontal. Some merging had occurred in the case of four craters in close proximity, producing a 'cross-like' structure. All the craters were now relatively shallow, with no evidence of active inflammation. This pathology might be interpreted as the result of multiple rounded compression fracturing from a blunt weapon, but there is no evidence of radial fracturing extending from any of these. A more likely explanation is that they were originally multiple destructive osteitic lesions which the individual survived.

F. Tancol. Tamaulipas

Db. 2-49. An adult male with caries and some ante-mortem tooth loss, of Post-Classic date. Two zones of osteitis were present on the skull at death. One is roughly in the midline and above the supraorbitals, with a maximum lateral width of 33 mm. The lesion is pitted and there are zones of greater bone destruction suggesting the focal superficial cavitation stage defined by Hackett. The second lesion is on the left parietal near the lambdoid suture – with a maximum spread of about 31 mm. Again there is pitting with areas of more advanced destruction.

G. Churubusco

Db. 2-52. Possibly a young adult male, of Post-Classic date. The skull displays without a doubt a massive erosive osteitis of the frontal area (Plate V), as well as small crater lesions on the parietals (near the lambdoid suture). Post-mortem damage obscures part of the surface structure of the face, but there was certainly an extension of the destructive osteitis on to the left malar bone. The inflammation on the frontal appears to have been generally active at death, and to have reached the serpinginous cavitation stage.

H. Pedregal San Angel

Db. 2-44. A mature male of Post-Classic date. Much of the vault (frontal, parietals, occipital) shows irregularities which might be best described as multiple smoothed craters.

Plate V The Churubusco skull, Db. 2-52, showing severe frontal pathology.

In no case is there evidence of active inflammation, but clearly this was extensive originally. At least the only reasonable conclusion to be drawn from the extensive nature of the irregularities is that the individual survived an extensive and perhaps slowly progressing treponematosis of the skull.

I. Tula, Hidalgo

Db. 1-2. An Aztec male (Post-Classic). The pathology of this skeleton is interesting and to some extent contradictory. Davalos (1964) has already suggested from the post-

Plate VI An Aztec skull (Db. 1-2) from Tula, showing some facial and frontal changes.

cranial pathology that the individual may have suffered from tuberculosis, and yet the changes to the skull are equally suggestive of treponematosis. There are in fact multiple healed lesions to the frontal and in the nasal area (Plate VI). On the frontal, there are four main zones (two lateral, one above the left orbit and one central). In two instances, a number of distinct zones of cavitation appear to have merged with one another. The nasal area also shows inflammatory changes – again with much healing now. The lower part of both nasal bones is deformed and the internasal suture is obliterated. The sides of the pyriform aperture are rounded and there is slight surface irregularity extending on to the outside of the maxillae. The vomer is nearly all destroyed, except for a small area at the back of the nose. This pattern of lesions and healing to face and frontal area suggests an earlier established treponemal infection which was followed by a quite distinct and destructive vertebral arthropathy.

J. Tlatelolco, D.F

One of the most impressive Mexican collections from the point of view of possible evidence for treponematosis, is the material from the Post-Classic site of Tlatelolco. As in the case of the Cueva de la Candelaria, we are dealing with a population in which more than one individual suffered from a disease which produced similar changes in the skull and forms of marked osteitis in the post-cranial skeleton. It is possible that at least seven individuals were affected to a noticeable degree by treponematosis, which would suggest that the total morbidity rate for this disease in the population would be considerable. Although a number of long bones show various degrees of osteitis, only in such cases as the bilateral spread of tibia periostitis in the immature individual, Ent. 112, or the moderate 'boomerang' shaft (left tibia) of Ent. 72-E (87), does it seem possible to make a special case for the pathology to be considered treponemal.

The following skulls, however, seem worthy of further note.

(a) Female. Ent. 26. A very important skeleton in view of associated cranial and post-cranial pathology. In the lower central zone of the frontal bone is an area of shallow irregularity with some stellate scarring. Even allowing for some post-mortem damage, it seems certain that the front of the dental arch was destroyed by infection and the palate to some extent perforated. The sides of the pyriform aperture were affected, with some recession, and the anterior part of the maxillary sinus chamber appears to be thickened and display periostitis on each side (Plate VIIa). On the external surface of the right malar bone is a small area of further periositiitis. Associated with these cranial changes are restricted areas of periostitis on both femoral shafts, an area of new bone on the right humerus shaft, a small destructive reaction (34 mm in length) on one ulna, and a widespread destructive osteitis varyingly expressed in both tibiae (Plate VIIb) and fibulae (with large and small nodes and cavitation).

(b) Male? Db. 2-3. There is widespread osteitis of the vault, especially on the right side (frontal to occipital). The area near the right half of the coronal suture was clearly active at death (Plate VIII) and the bone was destroyed through to the endocranial sur-

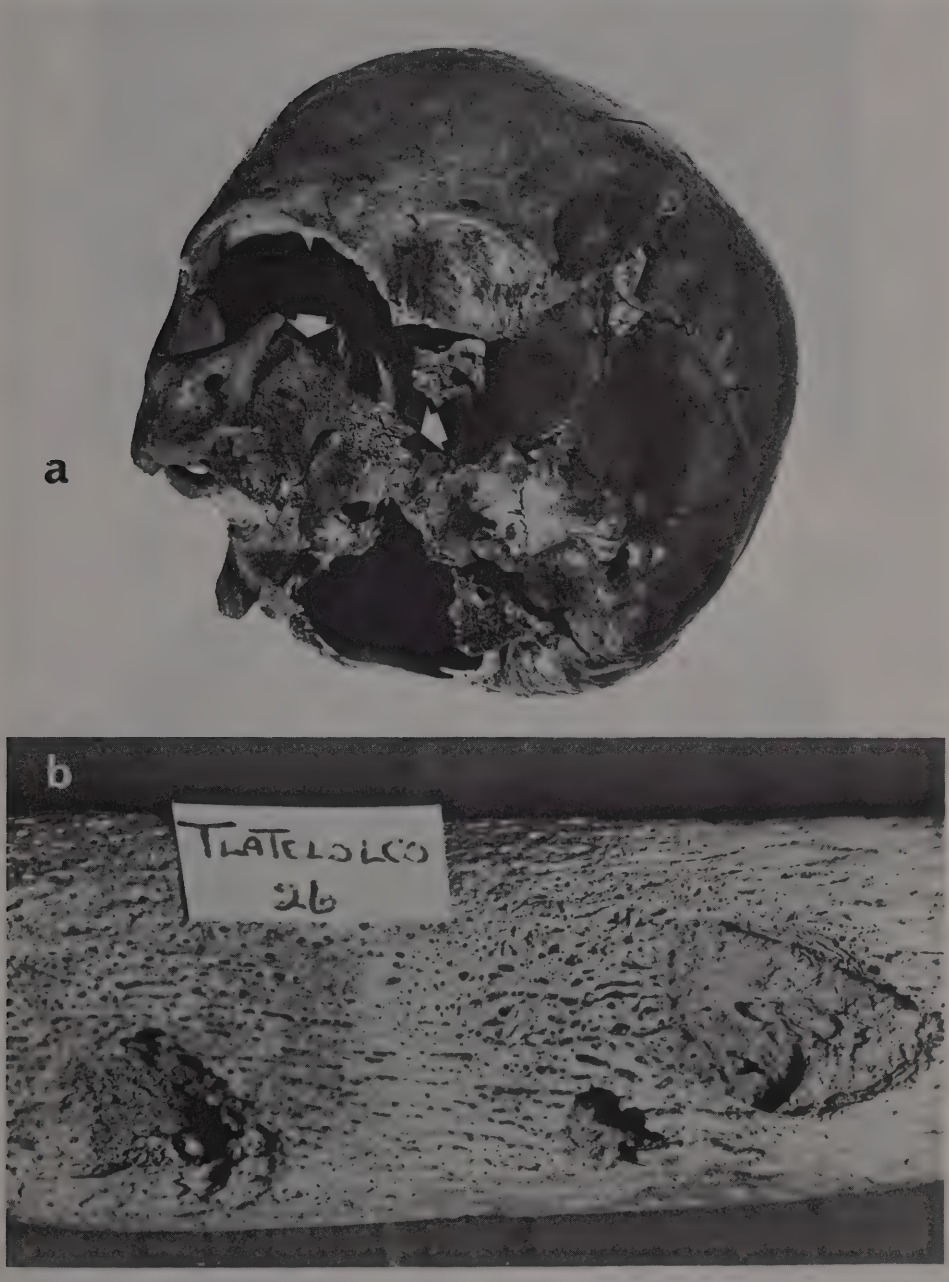

Plate VII (a) Tlatelolco skull 26, showing minor frontal irregularity and disease changes in the nasal area (arrowed). (b) Close-up of associated pathology in one tibia.

Plate VIII Tlatelolco Db. 2-3. General view of the skull and a close-up of the area of most advanced bone changes.

face in one small area. Small radial scars and some stellate scarring show that this was probably of long standing. Except for one possible small lesion near the margin of the left orbit (in front of dacryon), the face is not involved. A reaction on the interior of the cranial vault is localised to the region of the perforation of the inner table.

(c) Male. Db. 2-12. There are at least three old healed crater-like lesions on the frontal bone.

(d) Female? Db. 2-6. There is evidence of small scattered lesions on the frontal and parietals, and from the nature of the bone some are active and others are well healed. At least six are small healed radial scars and in fact it is in the frontal area alone that the infection appears still to be active.

(e) Db. 2-8. This case has already been well described by Davalos (1964) and Goff (1967), the latter author mistakenly relating it to the Cueva de la Candelaria collection. There is a severe, destructive, perforating osteitis of the skull typical of treponematosis.

(f) Db. 2-14. On a limited region of the frontal, but more extensively on the parietals, are areas of considerable irregularity in the form of healed craters and stellate scarring. It is uncertain whether there was any inflammation active at death. No facial pathology was to be noted.

(g) 104. A child with only the crowns of the third molars developed. There is evidence of widespread osteitis in the facial area, extending from the maxillary region onto both malars and up on to the supraorbital region. The infection also extends posteriorly beyond the zygomatic arches as far as the mastoids. Areas of active bone destruction occur, as well as some sub-periosteal new bone.

Conclusions

We see then that there are from Mexico at least 19 cases of pathology which must certainly be considered as possible evidence of treponematosis. Most of these individuals were certainly of pre-European-contact date, and some appear to have survived extensive bone destruction by disease, and show degrees of active healing. This could be taken to suggest that by at least Post-Classic times, the early Mexican communities had long experience of treponematosis, and in particular the Tehuacan example suggests that this may have been over as much as 2,500 years. Although one or two of these cases of cranial osteitis may have been the result of another micro-organism to that suggested, there seems little doubt from the evidence as a whole that some form of bone-changing treponemal disease had evolved in early Central America. Further studies of this material in the future may show significant links between its occurrence and changes in culture and the environment generally. The conquest of *Treponema* clearly extended across various cultural boundaries, from the Santa Maria Phase village people of Tehuacan, to those living in more advanced Toltec and Aztec societies. Whether the geographic range of the parasite is truly restricted to the Central Plateau and north-east of Mexico – as so far indicated by the finds – is debatable. Caution is needed as regards the naming of the disease, even if it is clearly the result of *Treponema*. If the treponemal disease group has a long history of independent micro-evolution in the New World, then the modern clinical

conditions which are mainly the result of studies on Old World populations may not simply be comparable with early Amerindian treponematoses. Moreover, the establishment of a bone-changing treponeme in Pre-Columbian Central America, poses the question of its relationship in evolutionary terms to non-bone-changing pinta, previously considered to be the only Pre-Columbian New World treponematosis (Hackett, 1963). In terms of phylogenetic complexity, the micro-evolution of *Treponema* could yet turn out to be more complex than modern population data can suggest.

Acknowledgements

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Abstract

A series of human pathological specimens are described from 10 sites in Mexico. In date they all seem likely to fall within the time range 900 BC–AD 1200. The bone changes are compared with the pattern of change known to occur as a result of treponematosis, and it is suggested from the similarities that these early Mexicans had been infected with an early variety of *Treponema*. If this is correct, then at least some groups in Central America had a long history of association with the disease group which includes pinta, yaws and syphilis.

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A simple wooden bipod for vertical photography

by DAVID FLEMING

Introduction

Low-level vertical and oblique photography of ground features is one of the most valuable techniques available to archaeologists, since it may be used to produce plans and drawings of large areas in a very short time and with considerably less effort than is required by a surveyor or an architect working directly. The equipment for this sort of work may be built either by local craftsmen or by the excavators themselves, and the design of the bipod discussed below is one that may be produced in materials which may be obtained virtually anywhere in the world for very little cost. The bipod will not produce results as accurate as those obtained by photogrammetric methods, but we feel that this may be excused by the great flexibility and convenience of the design which should recommend it to those who have large areas of ground to cover in a short time with as small an expenditure as possible.

The bipod compared to other photographic towers

Designs for photographic towers usually envisage a free-standing structure with either four legs (Simpson and Cooke, 1967) or with three legs (Nylén, 1964; Cooke and Wacher, 1970) whose inherent stability will guarantee the safety of both the photographic equipment and the operators, and whose relatively large spread of leg will permit the use of high boom extensions to raise a camera up to 15 m above the ground. However, these designs are cumbersome to transport and assemble and generally require a fairly sophisticated engineering of components which increases their cost and reduces their reliability in extreme conditions. The photographic bipod as described by Whittlesey (1975) and Fleming (1976) must be held in position by guy-ropes to prevent its toppling over, but because of its extremely simple and robust construction it may be produced more cheaply and used more extensively than a structure with more legs.

The bipod built by Whittlesey (1975: 234) is made of braced telescopic metal tubing, although he briefly describes a second bipod built of sections of plastic pipe (Whittlesey, 1975: 239). The apparatus is raised with a winch and the camera is slung from a crossbar on a gimbal mount to ensure that the film plane is horizontal at all times. Stereo pairs or

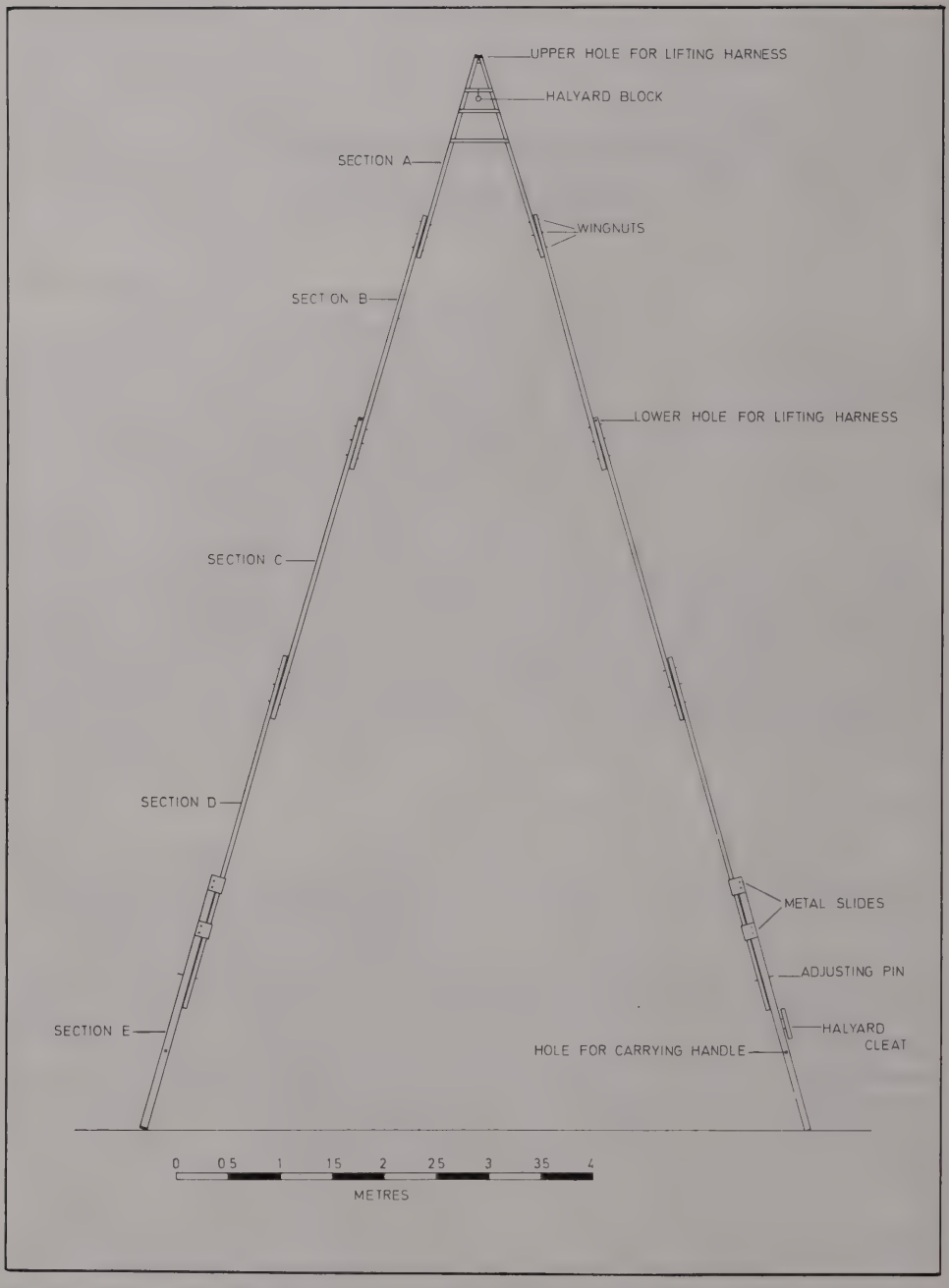

Fig. 1 Photographic bipod fully extended.

sets may be obtained by swinging the legs and allowing the camera to move over a section of ground in a straight line (Whittlesey, 1975: 237, Fig. 59) which allows for considerable overlap to ensure a minimum of distortion.

The disadvantages of the system proposed by Whittlesey are its expense (about US $1,500, Whittlesey, 1975: 239) and its complexity. Personal experience has shown the writer that any apparatus used in extreme and remote conditions must be as simple as possible and built in materials that may be easily repaired or replaced, since local resources may be, at best, limited and at worst, non-existent and damage to complicated equipment may lead to delays or even the cancellation of stages of vertical photography, with corresponding losses in excavation time and performance. The design should be simple enough that its transport, assembly, and erection may be carried out by a staff of two or three in a short time.

The original design of bipod used at Jawa in eastern Jordan in 1974 (Fleming, 1976: 30, Fig. 21) was replaced in 1975 by a modified design which permitted the raising of the camera to about 10 m above the ground (Fig. 1; Plate I). The bipod was built of squared timber (for dimensions of the structural timbers see Table 1) and the sections of the legs were bolted together with wing-nuts to allow a rapid assembly and breakdown of the bipod. The raising harness was made of rope (Fig. 6) and our intention was to permit as much slack and play in the harness as was compatible with safety to prevent the creation of unnecessary stresses which would have strained the wood and made operation of the bipod more difficult than was necessary. Wood was chosen partly for its availability in country areas (this particular design has been used at Jawa in Jordan and Kandahar in Afghanistan) and partly for its flexibility and resilience if dropped or otherwise abused. Although metal tubing as proposed by Nylén (1964: 9) and by Cooke and Wacher (1970: 214) offers the advantages of rigidity and standard sizes, one should remember that in tropical and desert regions metal becomes too hot to handle for much of the day, while the use of telescoping sections (as with Whittlesey, 1975: 234) is vulnerable to dust and dirt and to the possibility of a tube being bent and hence rendered useless.

Construction of the bipod

The bipod is built up of wooden sections bolted together, in which the holes for the connecting bolts should be made with a drill press to ensure that they are perpendicular. The sections, whose dimensions and degree of overlap are shown in Table 1, should be made of clean, knot-free timber which has been smoothed to reduce splinters and to allow parts to slide against each other where necessary. The only components of the bipod which must be precisely made are the four mild steel slides (Fig. 2) which are bolted to section E at the top and at a distance of 60 cm from the top (Fig. 3) to serve as guides for section D so that the relative lengths of the two sides of the bipod may be adjusted to keep the top of the bipod horizontal during use. To adjust the relative lengths

Plate I Photographic bipod standing.

Table 1 Dimensions of the structural timbers used in the construction of the bipod

	Length (m)	Cross-section (cm)	Overlap at base (cm)
Section A	2.00	3.5 × 3.5	40
Section B	2.50	4 × 4	50
Section C	3.00	4.5 × 4.5	60
Section D	3.50	5 × 5	–
Section E	3.00	5 × 6	–

of the two legs a hole is drilled through section E at a point 100 cm below the top of the section for the adjusting pin to pass through, and corresponding holes are drilled at 10 cm intervals through section D, beginning 30 cm from the bottom and numbering 10 in all. The adjusting pin which passes through both sections to hold them in place need be no more than a long nail, but more convenient to the hand is a screwdriver with a long and narrow shaft, which may in addition be fastened to section E by a short length of twine or wire to prevent its loss.

The greatest care must be taken in the construction of the head of the bipod (Fig. 4) since this part houses the camera mount and its halyard and the upper part of the

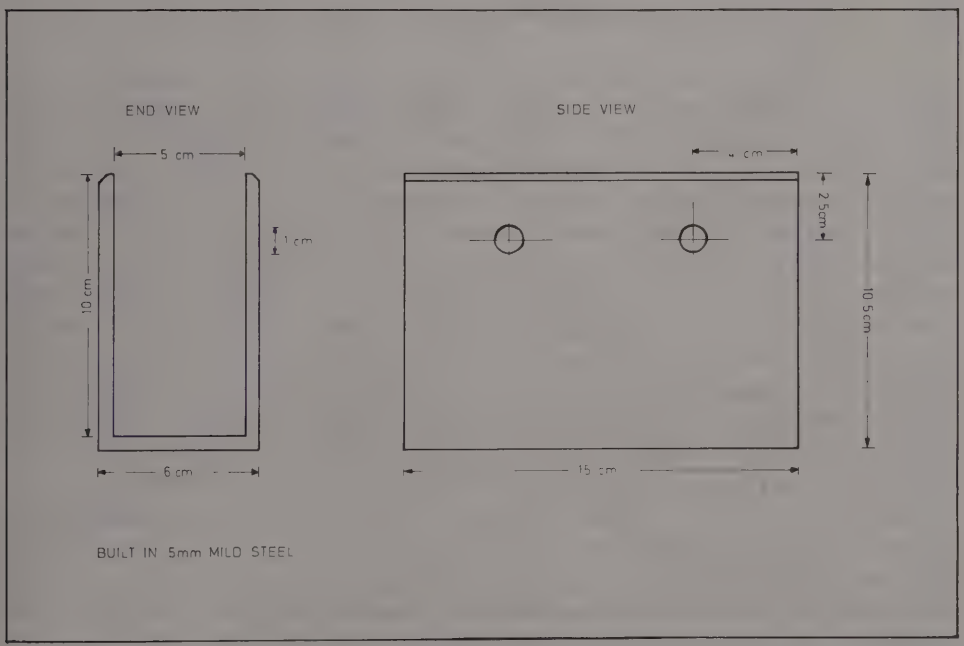

Fig. 2 Metal slides to be mounted on section E.

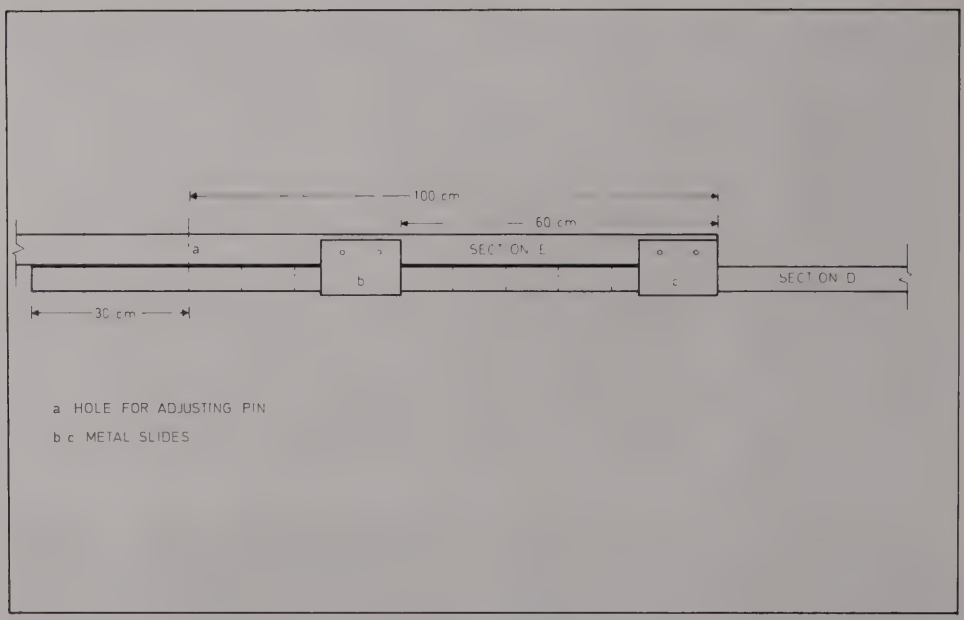

Fig. 3 Detail of adjusting pin and holes in sections D and E.

lifting harness. The topmost of the four crosspieces is solid and of the same cross-section as the timber of the two sections A; it is glued into place 4.5 cm below the top of the sections A and is secured by a bolt passing through it and both sections as shown in Fig. 4. The second crosspiece is made of two pieces of wood 3.5 cm square glued together after a space for the sections A has been cut in each end and a slot for the halyard block has been made in its centre. The halyard block is an important part of the bipod and care must be taken to ensure that it hangs freely and that the halyard will not jam in it or leap off the wheel; experience has shown that this will usually occur when the camera is up at the top of the bipod, and its rescue requires the exercise of considerable caution in the lowering of the bipod to free the block. The best sort of block to use is that sort which runs on ball bearings and is sold for racing yachts, where if a halyard jams it could have results infinitely worse than on an archaeological expedition. The third crosspiece is the simplest and consists only of two pieces of wood of the same cross-section as section A (3.5 cm) bolted to the outside of the frame and leaving a space between them through which the halyard may pass. The fourth crosspiece is the most important as the camera mount slots into it, for which reason a particular effort must be made during its construction to ensure that this particular crosspiece is horizontal when the bipod is standing on level ground. This crosspiece is made up of four pieces: two outer pieces the full width of the head, and two inner pieces which are shaped as shown in

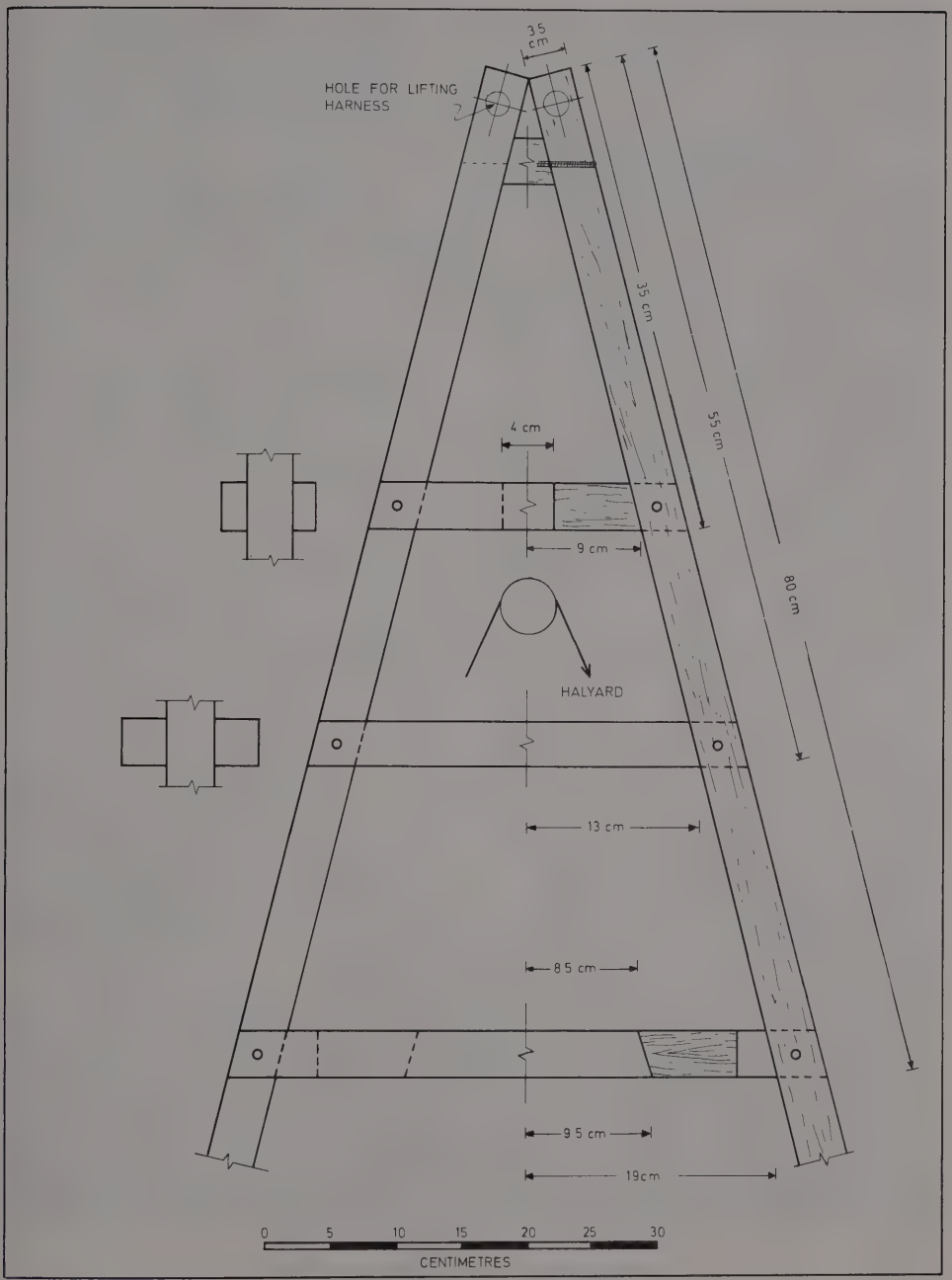

Fig. 4 Bipod head with dimensions.

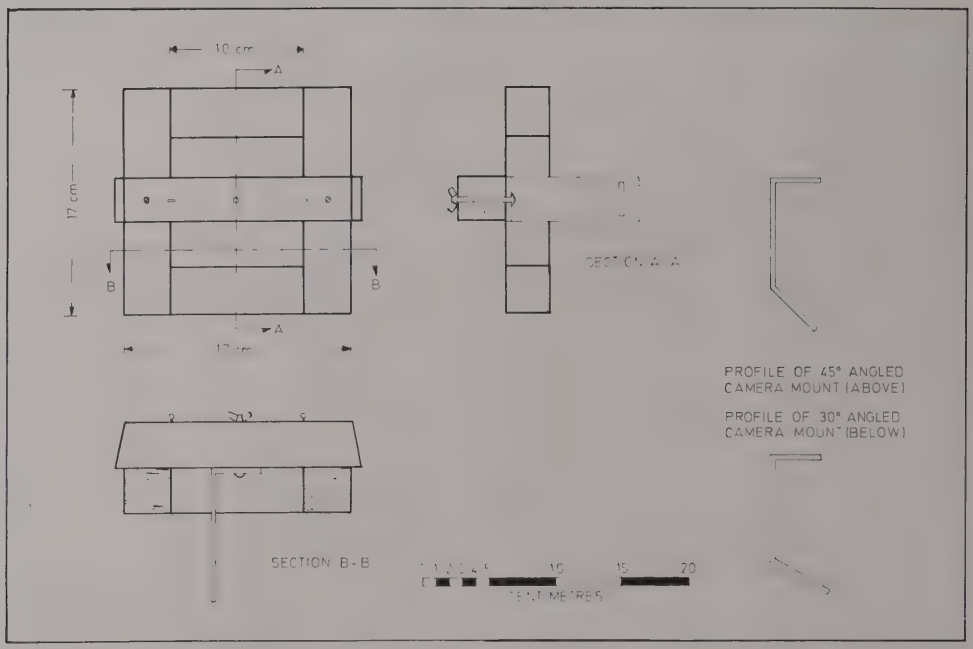

Fig. 5 Camera mount with dimensions.

Fig. 4 to keep the halyard away from the camera mount and to guarantee that the camera mount fits tightly into the head so that it does not move about when a picture is being taken. The lower edges of the slot into which the camera mount is to fit should be rounded so that the halyard does not fray when it rubs the crosspiece and so that the camera mount may be pulled into place without catching at any point. A heavy black line should be marked at the very centre of this crosspiece on the underside so that the operators may check that the camera is hanging vertically and hence that the bipod is perpendicular to the ground before a photograph is taken.

The camera mount (Fig. 5; Plate II) is built of timber of the same cross-section as the head, that is 3.5 cm. The four pieces that make up the square frame need only be firmly glued together, as they merely stiffen the mount and bear no strain, but the crosspiece that holds the halyard clips and the camera bracket should be glued and bolted to the square frame. The ends of the crosspiece should be bevelled as shown in Fig. 5 and all edges of the camera mount should be smoothed down so that it does not catch in the bipod head at any point, since it must fit tightly but without sticking. The halyard is clipped (not shackled, as shown in Plate II) to the two screw-eyes which are inserted into the upper side of the crosspiece, and the camera bracket is secured to the camera mount by a long bolt which passes through the crosspiece and is tightened with a wing-nut.

Plate II Camera mount and camera bracket.

The halyard is made of fine line and must be at least 30 m long to allow the camera to be fully lowered when the bipod is standing over a deep trench. This line and all the lines should be of natural fibre, as nylon line is too elastic, too difficult to splice, and somewhat temperamental in high temperatures. At the upper end of the halyard there should be a yoke of the same line whose two portions are 30 cm long and each of which ends in a snap-link so that the camera mount may be removed without difficulty from the halyard when the bipod is moved or disassembled.

The camera bracket is made of aluminium or mild steel bent into an L-shape, with a hole for the bolt through the crosspiece of the mount and a slot for the screw holding the camera itself (Fig. 5). This particular example is designed for vertical photographs, but oblique photographs may be taken by making separate brackets shaped as shown in Fig. 5 which will hold a camera at an angle of 45 or 30° to the horizontal. The bracket may be rotated to any position, and it is useful to mark angular divisions of 30° around the hole for the bolt through the crosspiece so that in panorama work a regular interval between exposures is possible, which makes the subsequent joining up of the resultant photographs very easy. For taking vertical photographs, a horizontal line scribed in the metal of the bracket near the camera screw slot will enable the user to make sure that the film plane is horizontal (see Plate II).

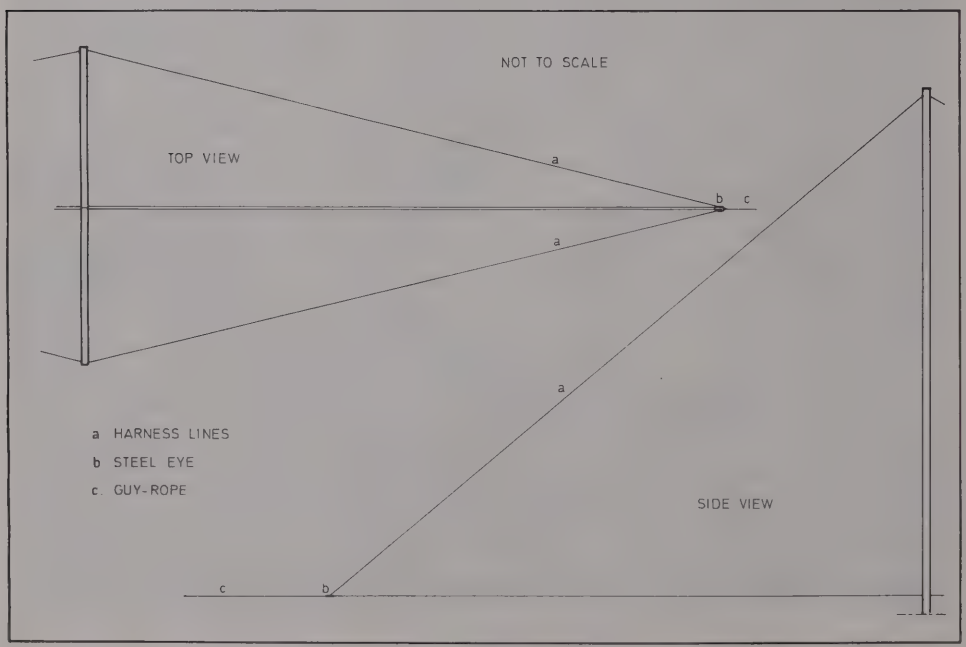

Fig. 6 Lifting harness, top and side views (not to scale).

Plate III Bipod being raised.

The harness for raising and lowering the bipod is extremely simple in design, but effective in operation (Fig. 6; Plate III). The two long guy-ropes (each should be at least 20 m long) must first have a 5 cm steel eye spliced into one end and firmly whipped into place. A 1 cm hole is then drilled horizontally through the top of each section A and section C (Fig. 1; Fig. 4) to accommodate the harness lines. Four lengths of line, each 10 m long, are needed, two for each of the left and right sides of the bipod. Beginning with the left side, the two lines are first passed through the hole in section A from front and back, and the ends are each separately knotted with a figure-of-eight knot. The other end of each of the two lines is then passed through the steel eye of the guy-rope on the front and back respectively and finally through the hole in the top of section C from opposite sides and then knotted. This entire procedure is repeated with the right side, so that one is left with a pair of identical triangles at the front and the back of the bipod which are held in place by the steel eyes of the guy-ropes. The steel eyes allow the guy-ropes on each side of the bipod to slide along the harness so that irrespective of the angle of the bipod the strain on each end of the two harness lines is equal; were the guy-ropes fixed to the harness, the strain on the very top of the bipod (the most fragile part of the structure) would increase as the bipod came away from the vertical in lowering and would

be such as to prevent the bipod being raised without a probable fracture of one of the upper sections.

An essential part of the harness is a lifting pole for the initial stage of raising and the final stage of lowering, since without this artificial aid the angle of the guy-rope taking the strain becomes too shallow to hold the weight of the bipod and it will either refuse to leave the ground or will come crashing down to it with possibly harmful results. The pole itself should be 3–4 m long and furnished at one end with a U-shaped metal crutch which can engage the harness just at the point where the steel eye holds it; the pole and its operator can then take the main weight of the bipod so that it may be lowered the last 2 or 3 m, or raised until the operator holding the guy-rope can pull it up further (Plate III).

Use of the bipod

The principal use of the bipod is in recording the excavation of trenches so that work in these can proceed without long interruptions for surveyors. Two points must be noted here: the bipod is most accurate when the trenches have been laid out on a grid 5 or 6 m square; the characteristics of camera optics are such that the most accuracy is obtained when the features of the trench do not show a great difference in height, since a high feature in a trench will appear larger than it should as its top is closer to the lens than the trench floor. If a trench produces a high wall or some other prominent feature it should be planned by a surveyor or architect to avoid the effects of perspective. Alternatively, scales may be placed at different heights in a deep trench or on a prominent feature to allow the same negative to be enlarged more than once so that in successive enlargements the scales are the same size to counteract any differences due to perspective.

The most useful lens for general planning work with a 35 mm camera is the 35 mm wide-angle lens which is available for virtually all models of miniature camera; the distortion that occurs with this lens may be minimised by the substantial overlapping of successive photographs, and the amount by which successive exposures will have to be overlapped may be deduced from Table 2, which shows the maximum coverage of a 35 mm lens at various camera heights. An overlap of about 40% is suitable for most camera work, as this amount is a useful compromise between low distortion, which

Table 2 Coverage with 35 mm lens with 63° diagonal angle of acceptance mounted on Nikon F

Camera height (m)	Coverage long axis (m)	Coverage short axis (m)
9	8.85	5.70
9.5	9.35	6.00
10	9.85	6.30
10.5	10.30	6.60
11	10.80	6.90
11.5	11.30	7.25
12	11.80	7.60
12.5	12.30	7.90
13	12.80	8.20

Plate IV Mosaic of Trench UT I at Jawa in Jordan made of eight separate overlapping photographs; trench is 10 m square.

requires closely packed photographs, and quick or extensive coverage, which demands widely spaced photographs. The most effective camera release is a pneumatic cable release which may be bought in lengths of up to 10 m but care must be taken in its use to prevent it being cut or broken. The shutter speed should be set as high as is possible to eliminate the effects of the bipod wobbling during photography. The aperture and focused distance should be set as required before each shot, and the settings may easily be made secure by binding the focusing ring and aperture ring to the lens barrel with masking tape.

Plate V Mosaic of Citadel at Jawa made of 64 overlapping photographs; building is 25 m square.

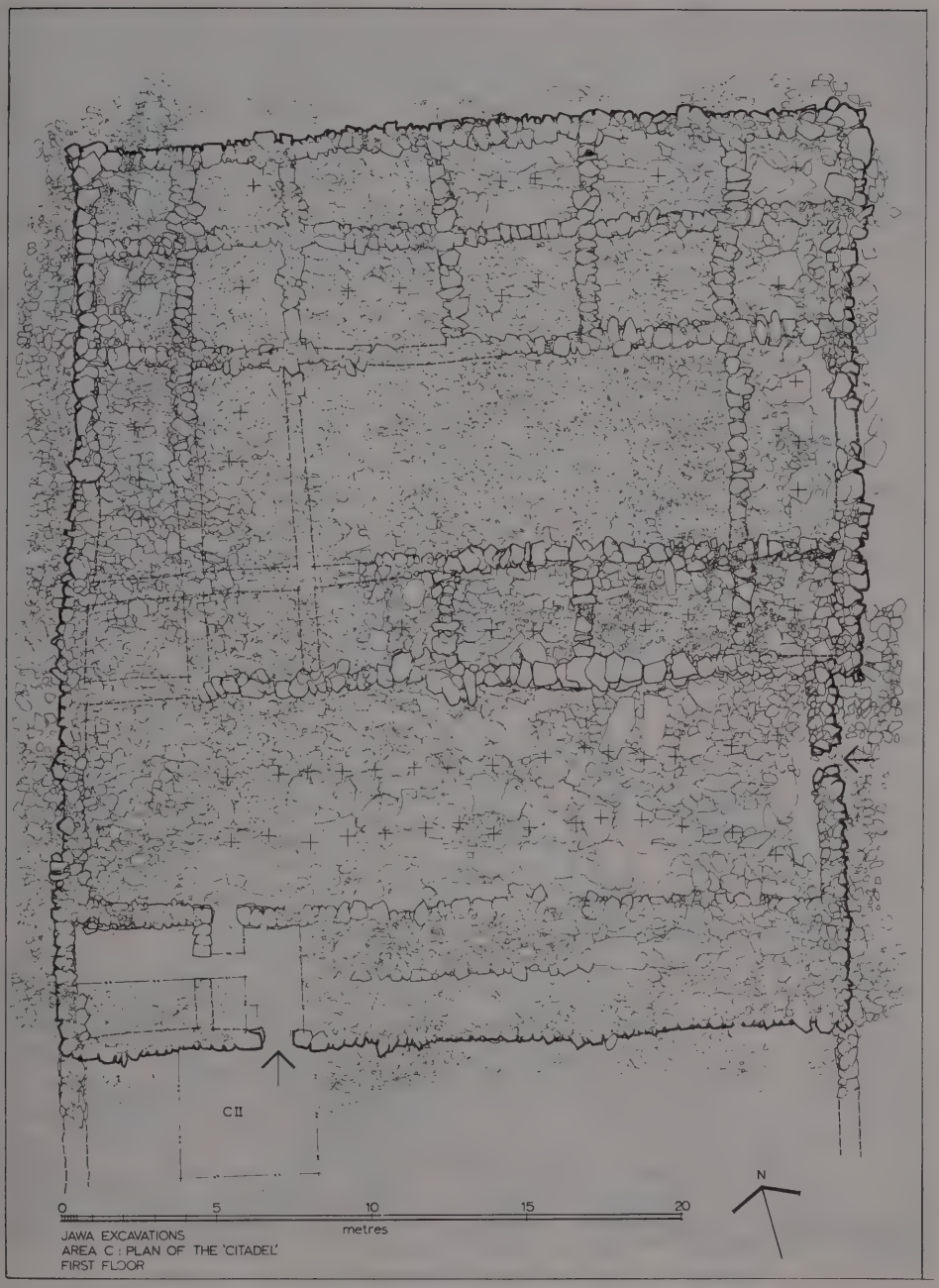

Fig. 7 Plan of citadel at Jawa in Jordan to compare with Plate V.

Plate VI Oblique photograph of dam at Jawa.

In the photography of trenches laid out on a grid pattern the bipod should be set up at the grid points and half-way between them in order to provide as complete cover as is practicable (Plate IV). A horizontal scale of 2 m on the floor of the trench is essential for determining the precise scale to which the photographic mosaic should be enlarged for copying or tracing, and if possible the photographs should be taken either when the sun is very low in the sky or when there is an overcast to prevent any loss of detail from glaring highlights and deep shadows. Alternatively, diffusers made of gauze or blankets and reflectors made of glossy white-painted panels may be used to reduce contrasts if photography is to be carried out in harsh sunlight.

It is also possible to produce large-scale plans of standing structures with a bipod. At Jawa in Jordan there was a free-standing stone building about 25 m square, whose detailed planning would have taken weeks by a surveyor. The building was accordingly marked with a 5 m grid and the bipod was used to produce a photographic mosaic of 64 prints (Plate V) which was carefully enlarged to a constant scale controlled by the grid markings and traced off to give a detailed and accurate plan of the building's upper surface (Fig. 7). This mosaic was obtained with the 7 m bipod described by Fleming (1976); had the 10 m bipod been used there would have been fewer photographs needed for the same coverage.

Where a section of ground has not been previously surveyed a satisfactory scaled photographic mosaic may be obtained by triangulating the ground between points which should be prominently marked with numbers so that they will be visible in the resulting photographs, and producing a scaled drawing of the triangulation. The photographic mosaic is then enlarged to the same scale and the features photographed may be traced off. This system is most useful where features are visible on the surface (walls, streets, etc.) but are too small or too tenous to merit a surveyed grid or full-scale excavation.

Another major application of the bipod is the production of oblique photographs which are useful for panoramas and for perspective reconstructions of excavated structures. For these one should use a camera bracket bent to an angle of 45 or 30° to the horizontal, as shown in Fig. 5, and the bracket should be turned so that the guy-ropes and the harness are as much out of the picture as possible. The resultant photographs will often show connections not immediately apparent on the ground: for example, the relationships of the successive dams at Jawa (Plate VI), where the new dam is in the foreground and the original dam is in the middle of the trench.

The total weight of the bipod will be about 100 kg, depending on the sort of wood used in its construction, and the disassembled components may be carried by two people, although progress may be slow. Of particular importance in the transport of the bipod is the need to avoid tangling the harness, since the unravelling of the lines can take much longer than expected.

Acknowledgements

I am grateful to Dr S. W. Helms, Mr P. G. Dorrell and Mrs Christine Page for their assistance and advice in the writing of this article.

Abstract

The advantages of a bipod for vertical photography over other forms of photographic tower are discussed. The construction in wood of a bipod which will raise a camera to 10 m above the ground is described in detail. The methods by which such a bipod may be used are outlined, and the various types of vertical and oblique photographs that may be obtained are described. The use of these for planning is explained. A table showing the ground coverage of a 35 mm wide-angle lens at various heights is included.

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The Palaeolithic sequence in Quaternary formations of the Orontes River Valley, Northern Syria: a preliminary report

by J. BESANÇON, L. COPELAND, F. HOURS and P. SANLAVILLE

Introduction

The Orontes river drains part of the northern Levant extension of the African Rift Valley. Rising between the Lebanon and Anti-Lebanon mountain chains, it is from the start a permanent and powerful stream, named in Arabic *Nahr el-Aassi*, the 'unruly' or 'rebellious' river. Flowing generally northward, it crosses the plains of Homs and Hama encased in a rocky gorge. It then follows the deep graben known as the *Ghab* in North Syria, before cutting through the mountains towards the Amuq Plain and the Mediterranean, into which it debouches near Antioch.

Although evidently favoured as a habitat by Palaeolithic man (Van Liere, 1960) the valley of the middle course of the Orontes had not been thoroughly surveyed for sites; thus, when an intact Middle Acheulean living-floor was discovered in 1960 (Modderman, 1964) at Latamne, north of Hama, and subsequently excavated by Clark (1967, 1968), there existed no firmly established or widely based chronostratigraphic sequence into which this rare archaeological occurrence could be fitted. The work of de Heinzelin (1966) indicated, however, that the area was rich in Quaternary formations.

This we were able to confirm in 1977; an area of some 100 km along the middle course of the river was chosen by us to be the subject of a thorough study of both the Pleistocene sediments and the Palaeolithic artifacts they contained. During the October field season we located a series of five fluviatile terraces; these were seen in 69 exposures in the stretch of the valley between Rastan and Acharneh (Fig. 1) and from them we recovered some 4,000 artifacts. The study of these enables us to extend the climatic sequence both backward and forward in time from the time of the Latamne living-floor.

As a result of this work, and that of our last year's field-season in the Lattakia region (in which the raised beaches and fluviatile terraces of the Nahr el-Kebir gave us an even more complete chronology, since it included the inter-glacials; Table 1), we are able to express some views on Acheulean cultural variability in the various climatic phases of the Levantine Lower-to-Upper Pleistocene (Fig. 2).

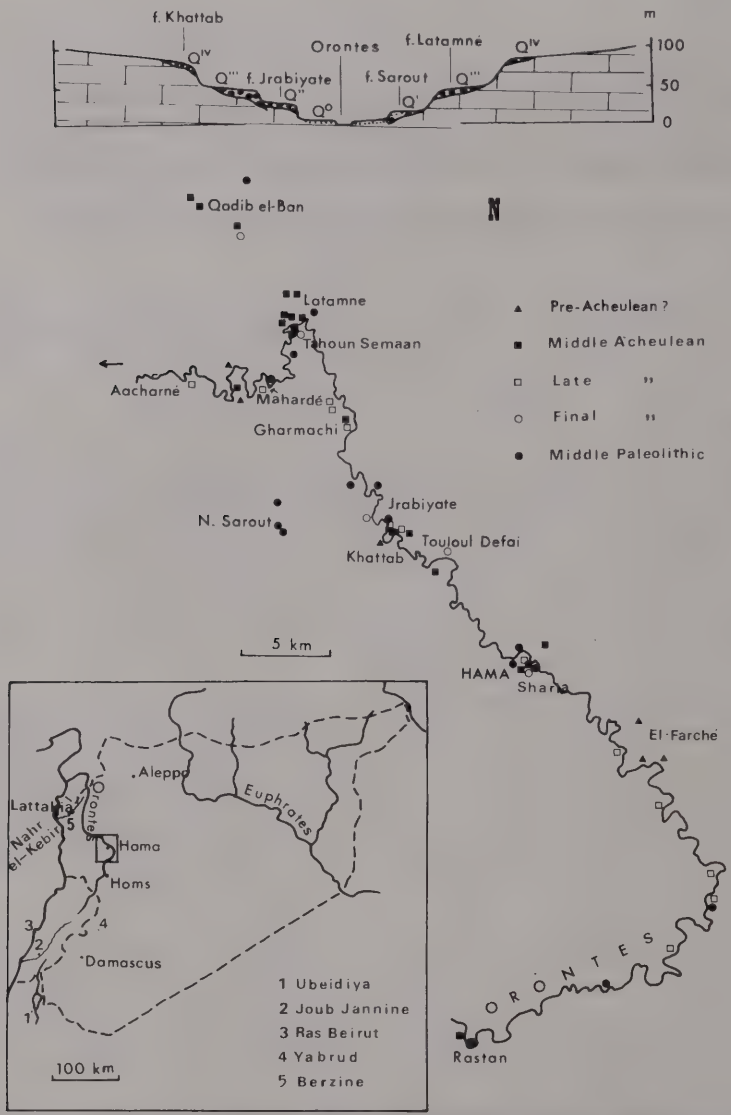

Fig. 1 Map of the area of the survey and schematised section showing fluviatile terraces in the Middle Orontes. Inset: Syria and the Eastern Mediterranean showing places mentioned in the text.

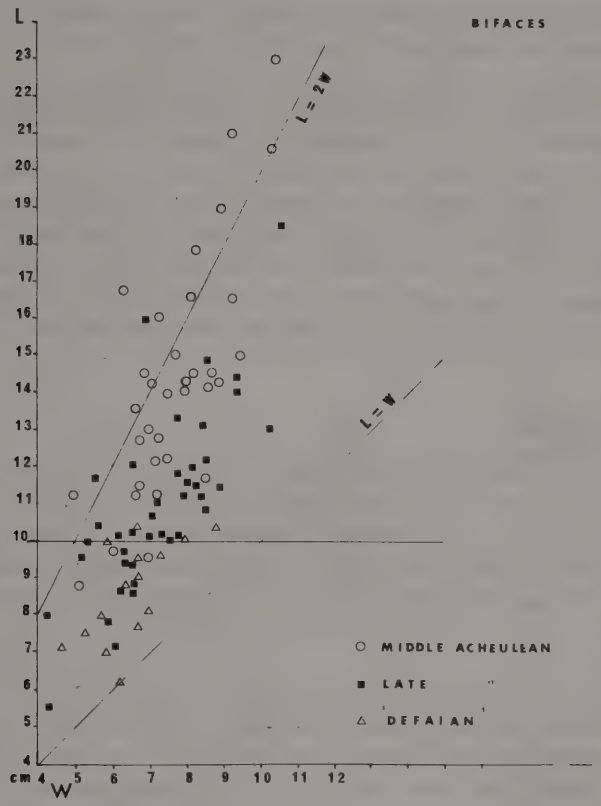

Fig. 2 Scatter diagram showing how the length and width of bifaces from sites in the Orontes Valley change through time. Open circle = 34 Middle Acheulean bifaces from Latamne Quarries 1–6; solid square = 40 Late (Evolved) Acheulean bifaces from Gharmashi; open triangle = 15 Final Acheulean (of Defaian facies) bifaces from Tahun Semaan 2.

Method and previous results

Our strategy was based on the close collaboration in the field of two geomorphologists (Sanlaville and Besançon) and two prehistorians (Hours and Copeland) who were accustomed to working together in the Middle East (see references in Sanlaville, 1977; Hours *et al.*, 1973). The aim of the field work was the establishment of secure local chronologies in different ecological zones (e.g. a littoral zone with Mediterranean climate; an inland, steppic zone; a desertic zone, etc.) which could later be compared and contrasted. Quaternary formations would be located by the geomorphologists, who would identify their chronostratigraphic positions, while the prehistorians would collect, classify

and relatively date such artifact assemblages as were found in context. When put together (and circular arguments eliminated!) the two lines of evidence would correct and complement each other.

The first stage (littoral zone) was completed in 1976 (Besançon *et al.*, 1977; Copeland and Hours, 1977, 1978; Sanlaville *et al.*, in press; P. Sanlaville (ed.) in press). As mentioned, the area chosen was the lower course of the el-Kebir river, near its embouchure, just south of Lattakia (see inset, Fig. 1). The results enabled us to construct a fairly complete chronology for the Lower, Middle, Upper and Final Acheulean in the Kebir region, and we were surprised to find that a Middle Acheulean facies, entirely different typologically from that of the interior (as known from Latamne, Jub Jannine and Ubeidiya), existed on the coast (e.g. at Berzine, Khellaleh and Jibtaa; see Table 1).

The Orontes Valley survey

This year the research area in the Orontes Valley consisted of two complementary zones: these are (1) the stretch between Rastan and Cheizar, where the river flows in a wide semi-circle, cutting a gorge through a chalky-limestone plateau, the valley varying between 1 and 2 km in width; and (2) after Cheizar, the river breaks through the escarpment and flows through the Acharne Plain, a depression which forms a kind of shelf, leading the river toward the final sharp drop into the Ghab proper, which was not examined by us.

Substantial river terraces are to be found in both zones. The most useful of our 69 artifact-bearing sites were the sections in the numerous gravel quarries, opened up into the fluviatile deposits in recent years. These exploit the uncemented shingle, sand and silty facies to provide road metal for the many large-scale construction-projects now under way, and many false sites now exist along the new roads.

Geomorphology

Although we use local names for the Orontes formations we denote their chronological European equivalents by using names both from the conventional Alpine sequence and from the somewhat more secure North German sequence, as seen in column 4 of Table 1.

Evidence supporting the following interpretations will be published separately (see also Besançon *et al.*, in press). With the exception of the latest (Holocene) one, the fluviatile terraces are for the moment considered to have had a climatic origin, and they are held to correspond in time to the glacials (or pluvials), that is, to periods more cool and perhaps more moist than the climate of today. Counting backwards in age, the terraces consist of the following:

1. A low Holocene terrace, very well developed, about 3–5 m above present river level. It contains both ancient and recent archaeological material.

Table 1 Correlation of the Quaternary and prehistoric chronologies in the valleys of two Syrian rivers: the Orontes (middle course) and the Nahr el-Kebir (near the embouchure).

RIVER ORONTES					NAHR EL-KEBIR					
					Formations					
Fluviatile formations	Main sites	Associated industries	European equivalents	Lebanese marine formations	Fluviatile	Fluvio-marine	Marine	Main sites	Associated industries	Remarks
Saroute	Tahun Semaan 1	? Levalloiso-Mousterian	Würm or Weichsel	Naamian	esh-Shir			esh-Shir Koura	Lev.-Moust.	Traces only, in both zones
	Tulul Defai Tahun Semaan 2 and 3	'Defaian' (Final Acheulean of Defaian facies)	Eem or Riss/Würm	Enfean				M. es-Samok Fidio Idriss IIIa	'Samokian' (Final Acheulean of Samokian facies)	Surface sites only
Jrabiyate	Gharmachi Ib Jrabiyate 1–3 Acharne Plain	Evolved Acheulean Late Acheulean	Riss or Saale		Jindiriyé			Roudo Souayate	Late Acheulean	Bifaces similar in both zones
			Holstein or Mindel/ Riss	Jbailian		Khellalé	Hennadi 80 m beach	Khellalé 4 J. Jibtaa	Middle Acheulean Phase 2	
Latamne	Latamne quarries Rastan	Latamne Middle Acheulean Rastan facies	Mindel or Elster		Berzine			J. Berzine	Middle Acheulean Phase 1	Different facies in each zone
			Günz/ Mindel or Cromerian	Zaqrounian		J. Idriss 120 m beach	Ch.-Mohammed (120 m) Baqsa 130 m beach	Ch. Mohammed J. Idriss	Early Acheulean Phase 2	
Khattab	Khattab 2 Maharde 2	? Pre-Acheulean	Günz or Menapian		Sitt Markho			Sitt Markho	Early Acheulean Phase 1	Probably different facies in each zone
			Pre-Günz	Chaabian				M. es-Samok 180 m beach		No contemporary industry

2. The next youngest is the Saroute Formation, attributed to the Würm or Weichsel glacial; it has in places survived to a height of 10 m, but in other places was poorly preserved. Generally silty, it also contained some coarse facies. It is named from a good exposure in the valley of the Nahr es-Saroute, an important Orontes affluent which drains part of the Jebel Alawiyeh.

3. Older than this is the Jrabiyate Formation, named after sections at Jrabiyate village, near Hama, and attributed to the Riss or Saale. It is an important feature, sometimes reaching a height of 20–25 m, often cutting into the older terrace above it, which had several very similar facies (this is perhaps why our predecessors had not identified a Riss terrace in the Middle Orontes region).

4. The Latamne Formation, a distinctive feature occurring prior to the Jrabiyate phase, i.e. corresponding to the Mindel or Elster glacial. It is also very substantial, reaching 30–45 m; it is formed of an extraordinary accumulation of loose flint pebbles, patinated to a characteristic chestnut-brown colour. Towards the summit it grades into a silty series of layers lighter in colour, easily distinguishable in the sections of many of the gravel quarries, especially in the environs of Hama (Sharia) and Latamne.

5. The Khattab Formation, which is earlier than the Latamne Formation and hence must be pre-Mindel/Elster. It is named after an outcrop near Khattab village, and consists of a conglomerate which covers the edge of the plateau between Rastan and Hama. Its components are very rolled, often concreted, and the flint pebbles are unpatinated, which facilitates their distinction from those of later formations. Some exposures are not as heavily cemented, and with a little effort, artifacts can be extracted.

The archaeological material

From the above-mentioned last four formations we collected and studied over 4,000 artifacts, about 3,500 of which were retained. These now repose in the Damascus Museum in charge of Mr Sultan Muhessen, of the Department of Antiquities of Syria, who is himself a prehistorian and who proved to be a most valuable fifth team member. Some 660 of the artifacts were retouched tools, which were described on index cards; 261 were drawn or sketched. Although the retained artifacts come from Quaternary context, we assume that they have been subjected to what Shackley (1974: 502) calls 'selective stream redeposition'; we use the term 'assemblage' in the broadest sense, to indicate groups of artifacts belonging to *one fluviatile phase* for each site.

The following comments on the assemblages and their context include some corrections to previous interpretations:

1. At Sharia in the Hama suburbs, artifacts attributed by Van Liere to the Late Villafranchian were found to be clearly of Mindel/Elster date, just as Van Liere had at first thought (1960). His backdating was based on the presence in the Sharia deposit of an *Archediskodon meridionalis* mandible, considered by Hooijer to be a Villafranchian

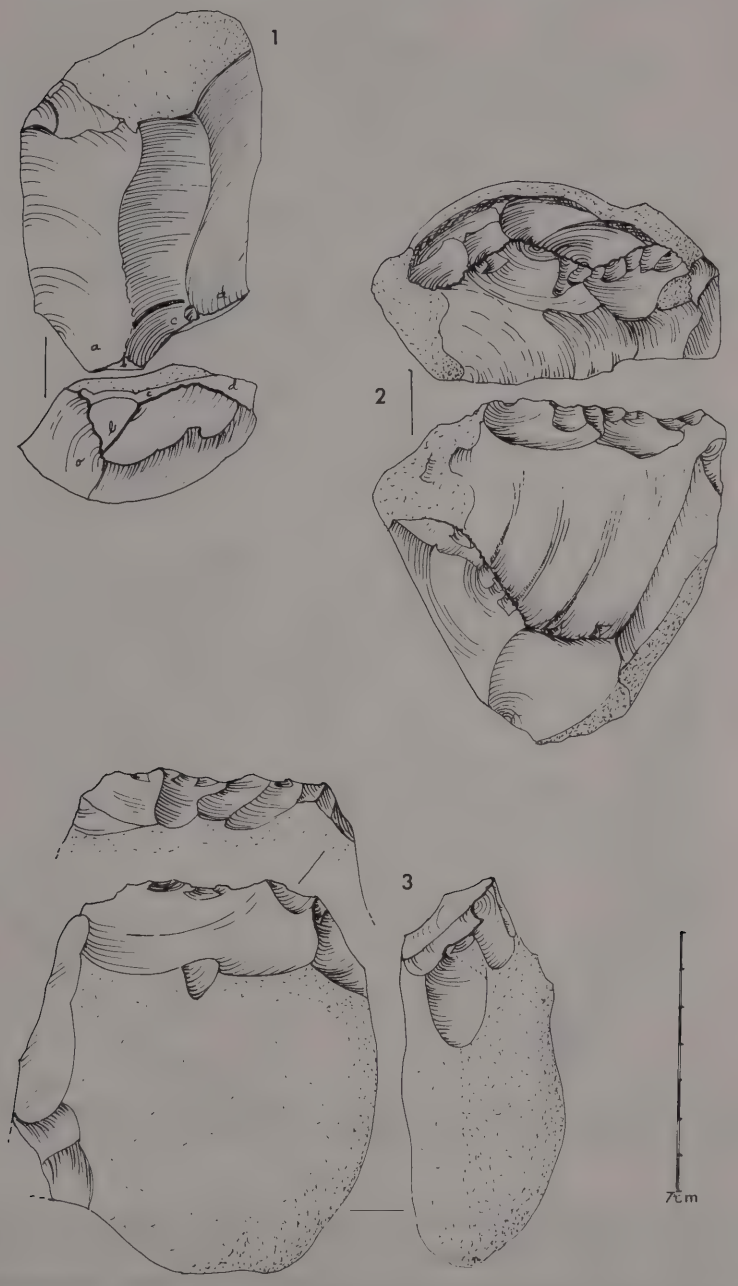

Fig. 3 Khattab 2, the Khattab Formation (Pre-Mindel). 1, Prismatic core; 2 and 3, chopping-tools.

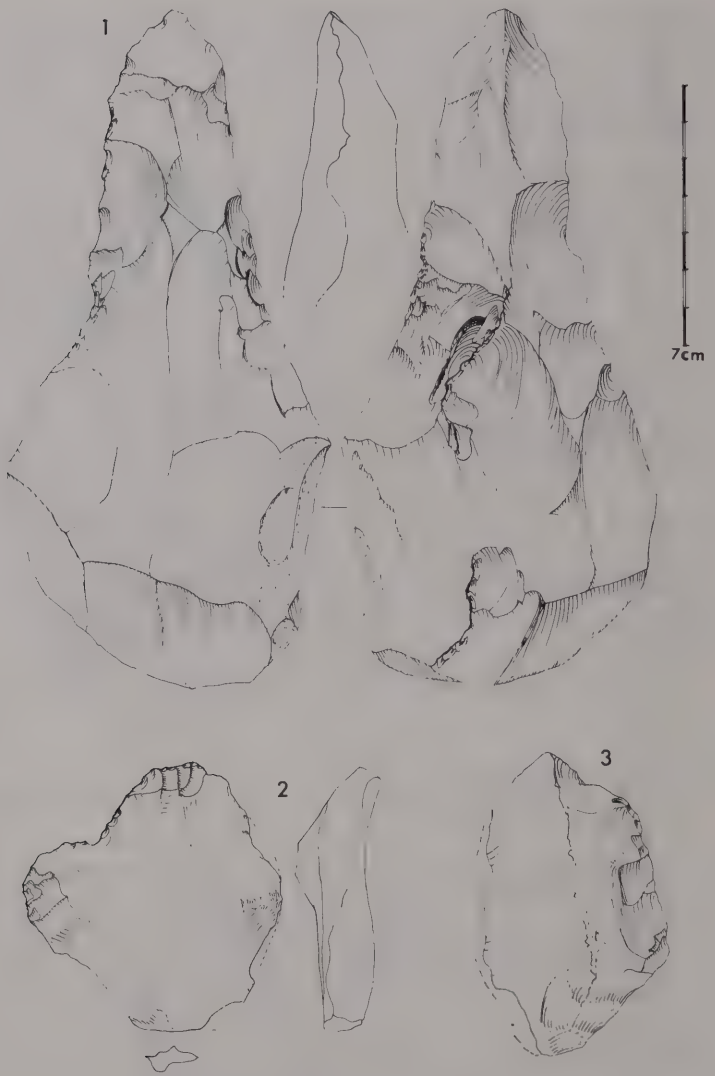

Fig. 4 Latamne Quarry 2; Latamne Formation (Latamne Middle Acheulean). 1, Ficron; 2 and 3, Scrapers on flakes.

type (Van Liere and Hooijer, 1961). However, the geomorphology indicates that the gravels at Sharia are part of the Latamne Formation. The *Archediskodon* is therefore also of Mindel date, or else derives from a higher, now destroyed, terrace. The former explanation seems the more likely, since not only is there no trace of an earlier terrace in the

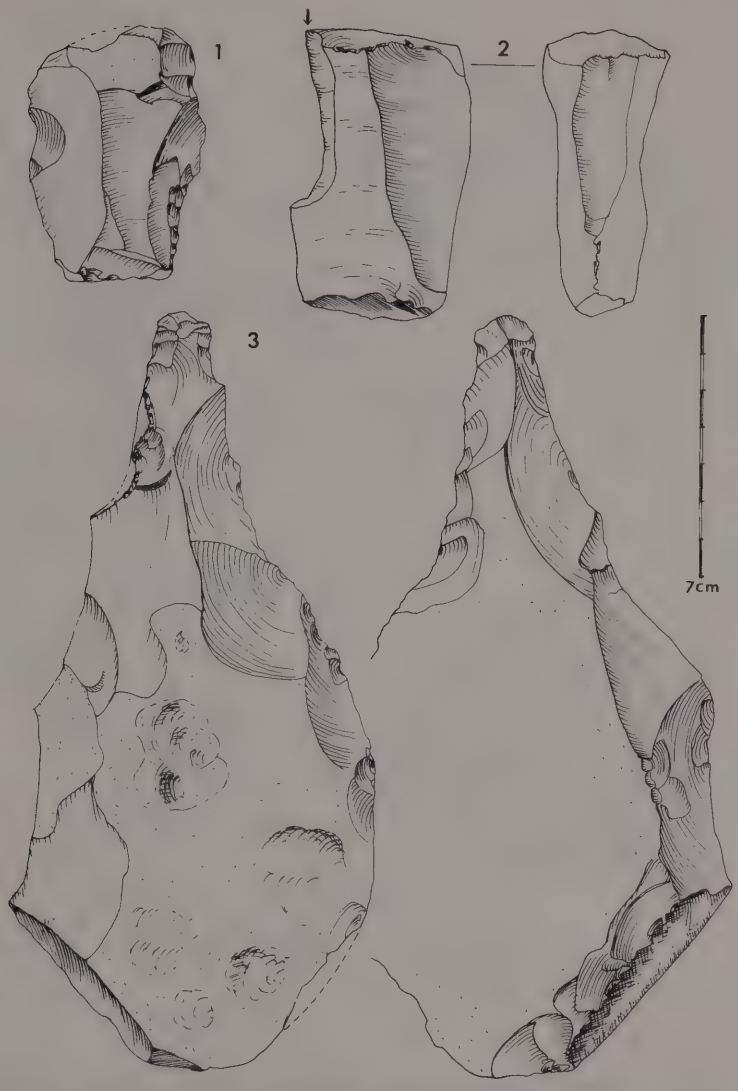

Fig. 5 Latamne Quarry 1, Latamne Formation (Latamne Middle Acheulean). 1, Scraper on a flake; 2, burin on a truncated flake-blade; 3, lanceolate biface on a slab.

vicinity, but this very large bone, with two teeth still in place, could not have travelled far judging by its present condition (it was examined in the Museum at Damascus).

2. About two dozen objects which seem to be of human manufacture were found in the pre-Mindel/Elster terrace; concentrated search at six sites by the team members

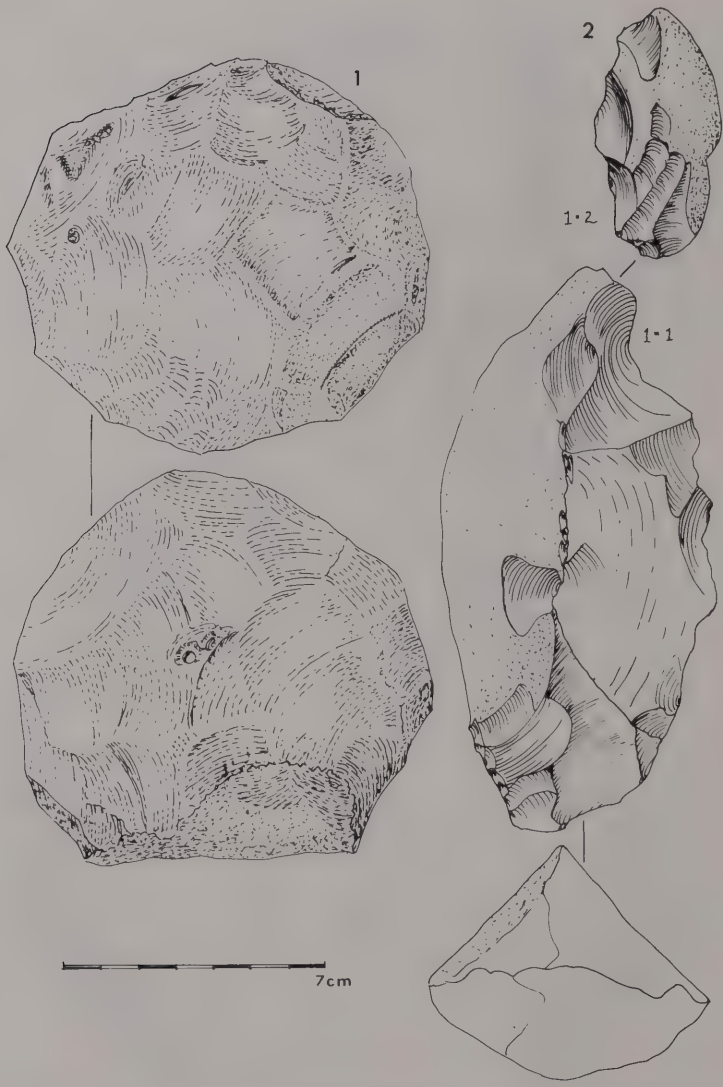

Fig. 6 1, Latamne Quarry 2, limestone spheroid; 2, Latamne Quarry 1, lateral chopping-tool.

failed to produce more than 10 tools (Fig. 3). The best site, Mahardé 2, was found on the last day and has not been fully studied; it contained three chopping-tools, a bifacial fragment and a large polyhedron. (These pieces should be broadly contemporary with the Sitt Markho assemblage in the Nahr el-Kebir (Copeland and Hours, 1977, 1978), which we found in a pre-Mindel/Elster fluviatile terrace at 130 m above sea-level; see Table 1.)

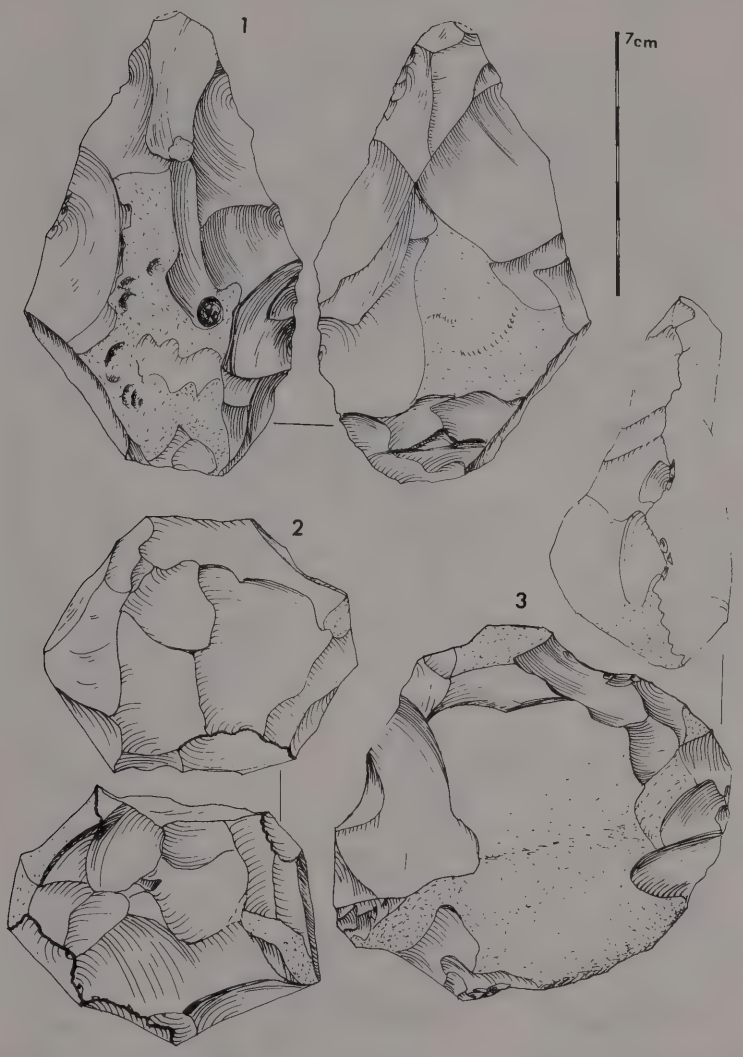

Fig. 7 Latamne Quarry 2; Latamne Formation (Latamne Middle Acheulean). 1, Short lanceolate biface; 2, polyhedron; 3, massive scraper or rabot on a flake.

Soil samples were taken from an outcrop near Khattab, in the hope that they would contain pollen, or rodent teeth, which could be relatively dated. The samples are under study at Lyons University.

3. It is confirmed that the living-floor at Latamne (Clark, 1967, 1968) occurs near the top of the Latamne Formation and therefore dates toward the end of Mindel, as suggested by Clark, and not to Mindel/Riss, the alternative date he mentioned.

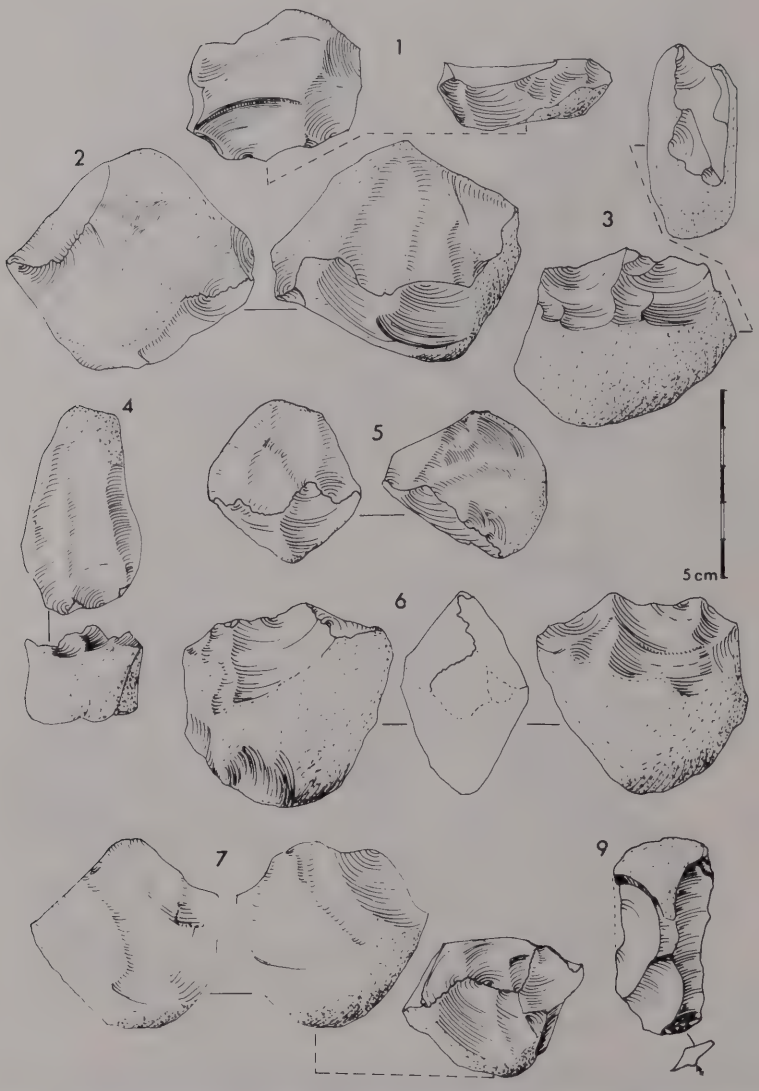

Fig. 8 Rastan, Latamme Formation (Rastan Variant: ? Middle Acheulean). 1, Flat flake-core; 2 and 5, partial biconical cores; 3, 6 and 7, distal chopping-tools; 4, prismatic core; 8, cortex-flake blade.

Middle Acheulean (Latamne Acheulean) assemblages closely resembling the industry of the living-floor, were found at 19 sites, within the gravels, but largely in secondary positions (Figs. 4–7); usually these were the sections or floors of quarries. The 921 artifacts recovered include polyhedrons of flint, limestone spheroids, bifaces of

Fig. 9 Jraibiyat 2, Jraibiyat Formation (Late Acheulean). 1, Cortex-flake showing radial preparation; 2, backed biface; 3, partial biconical core; 4, small cordiform biface.

lanceolate, ficron of trihedral form, trihedral picks, chopping-tools and backed bifaces (the bifacial knives of Clark's classification), all flaked by hard stone hammer techniques, as were the numerous light-duty tools on flakes. At two sites, Zakat and Qadib-el-Ban, traces of once-intact occupation horizons (probably similar to those noted by Modderman (1964)) were found; these have only recently been disturbed by the quarrying, to judge

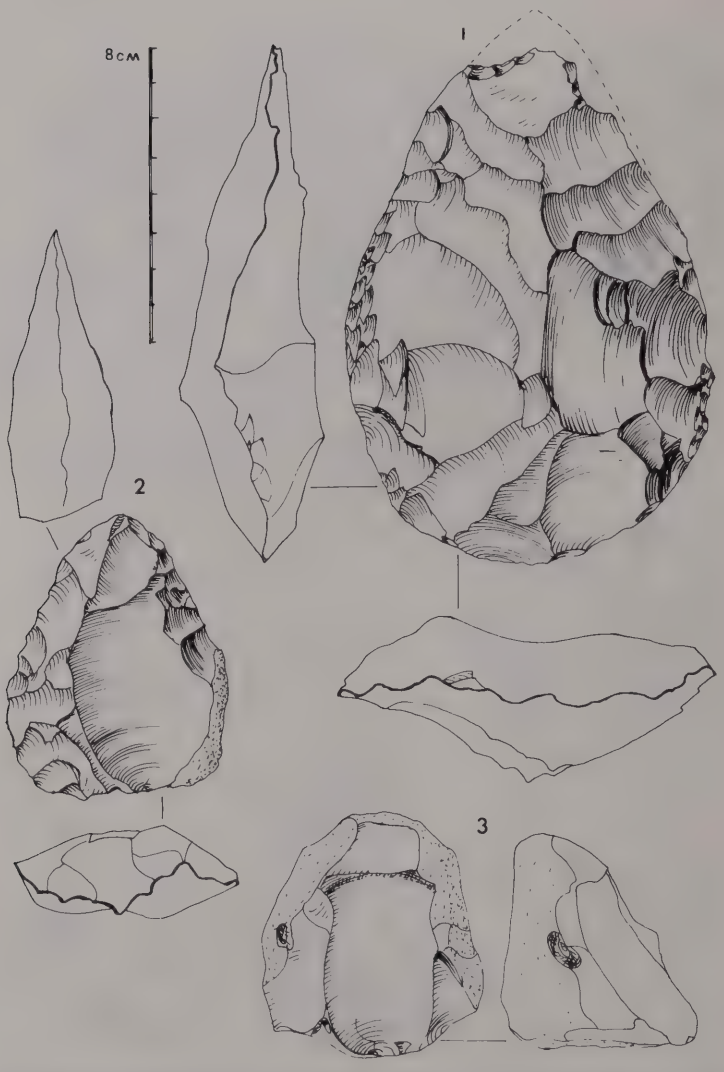

Fig. 10 Gharmashi Ib; Jraibiyat Formation (Late Acheulean). 1, Ovate biface; 2, small Amygdaloid biface; 3, prismatic core.

by the unpatinated state of the artifacts, with edges sharp enough to cut the fingers, and with the tips of the bifaces intact.

The quarries which in 1960 had produced fauna (Hooijer, 1962) have now ceased to be exploited, and only a few additional bone fragments were recovered. These include horse, elephant, *bos* and a large cervid; we have added one animal to the list already

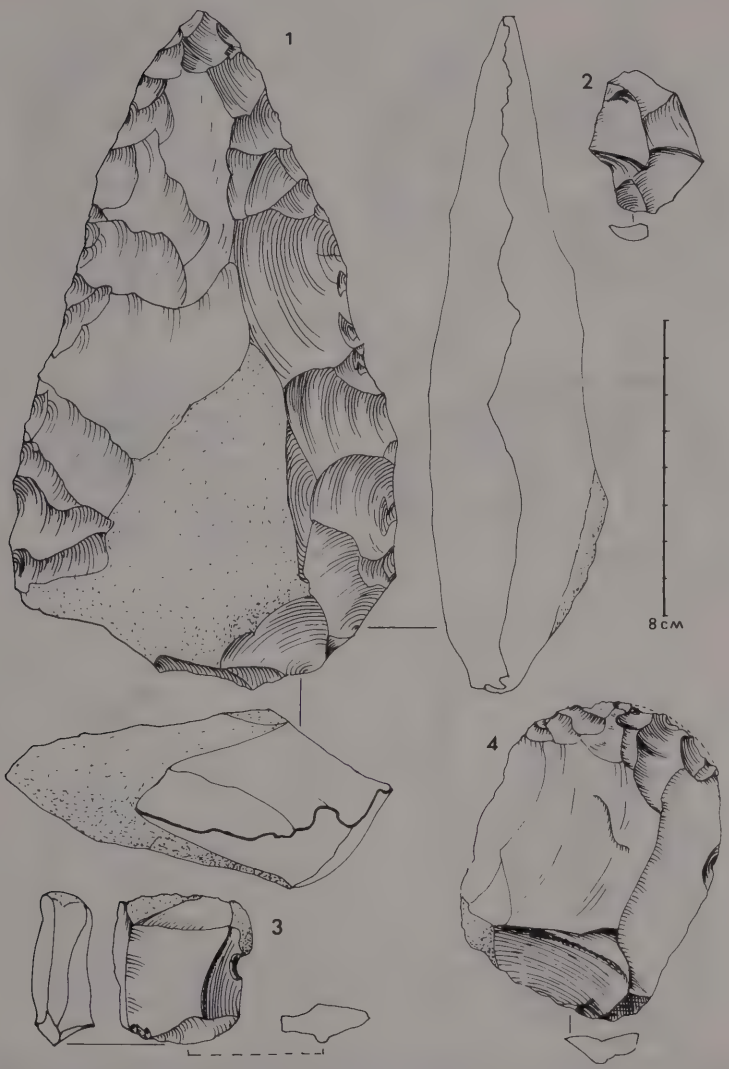

Fig. 11 Gharmashi Ib; Jraibiyat Formation (Late Acheulean). 1, Flat lanceolate or sub-triangular biface; 2, biface preparation-flake; 3, notch on a cortex-flake; 4, end-scraper on a flake.

published, giraffe (p.c. M. Guérin, of the Claude Bernard University, Lyons, who is studying the material).

4. An assemblage of artifacts from road sections at Rastan, previously published as Villafranchian, must also be redated to the Mindel, as the gravels here appear to belong to the Latamne Formation. However, the flint assemblage seems to be a special facies,

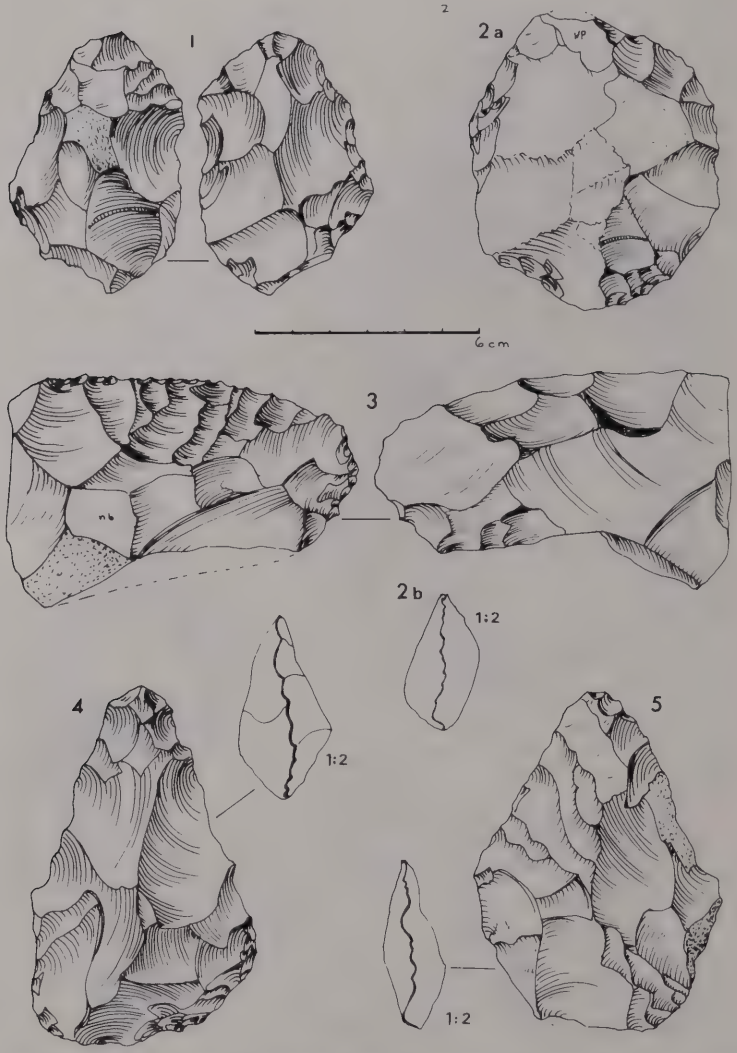

Fig. 12 Tahun Semaan 2; Saroute Formation (Final Acheulean – Defaian). 1, Small bifacial piece or disc, 2 cm thick; 2a, discoid biface; 2b, profile of 2a, half-size; 3, bifacial racloir fragment; 4, amygdaloid biface; 5, cordiform biface.

wherein all the tools are made on small, rolled river pebbles. Chopping-tools, polyhedric and other core types, and small tools on flakes were the only artifacts (apart from unretouched flakes) found (Fig. 8). Whether or not these attributes derive from the raw material, the function of the tools, or the cultural tradition, the Rastan assemblage contrasts with the living-floor facies, in which the tools (including the distinctive bifaces)

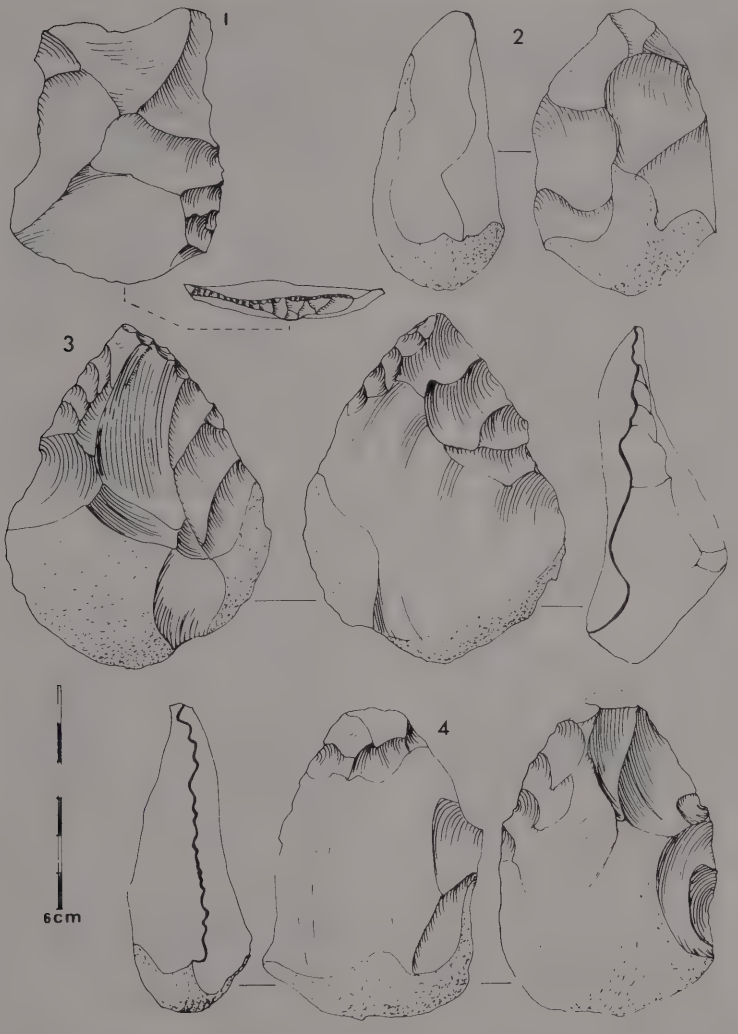

Fig. 13 1, Tahun Semaan 1: Saroute Formation; Levallois flake with radial preparation and 'kelb-type' butt (reminiscent of Ras el-Kelb flakes); 2, Tulul Defai (Final Acheulean – defaian); small ovate biface; 3, Tulul Defai; pointed ovate biface; 4, Tulul Defai; sub-ovate biface on a flake.

were made on large nodules or slabs from the bedrock. A possible explanation is that the plateau flint was covered (as it still is today) by basalt flows, so that the knappers were obliged to take their raw material from the river bed. We are indebted to Professor Desmond Clark (who read this paper in manuscript) for the interesting suggestion (letter, April 1978) that the Rastan material could represent a Developed Oldowan-like facies,

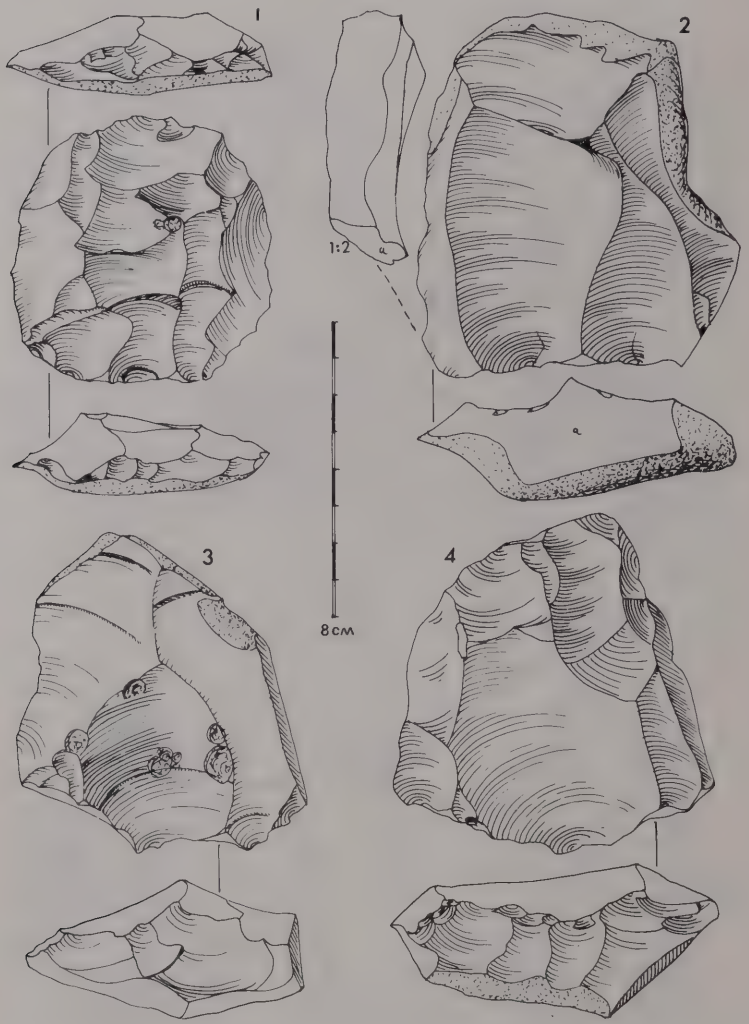

Fig. 14 Tahun Samaan 2; Surface (Final Acheulean – Defaian). 1, Levallois core; 2, Levallois core, unidirectional preparation; 3, Levallois point-core; 4, Levallois core, bipolar preparation.

along the lines of some of the assemblages in Ubeidiya, which could be of comparable (or earlier) date. It is worth noting that Rastan is separated from the other sites by about 30 km.

5. The Riss terrace gravels (Jrabiyate Formation), once identified, produced a good sample of Late Acheulean artifact types (1,282 pieces from 22 sites). The most striking difference between the Late and Middle Acheulean was found to be in biface morphology

(Fig. 2); in the later phase, the bifaces tended to be smaller, ovate or broadly pointed amygdaloids, flaked by soft hammer techniques (Fig. 9). The Rissian Acheulean flakes and flake-tools seemed very little different from those of the Mindel (Middle Acheulean), but some evolution could be seen in core and chopping-tool types.

A largely undisturbed Late Acheulean site, Gharmachi Ib, was found in soil overlying (hence post-Mindel) a Mindel conglomerate (Figs. 10 and 11). Fresh, unpatinated artifacts, including 22 bifaces, some of outstanding quality, were found eroding out of the surface soil on a bluff overlooking the river. The Mindel conglomerate underneath could be seen in section in the banks of the Wadi Gharmachi, a small Orontes affluent, which may truncate a part of the site.

Indications are that this was an Evolved Late Acheulean occupation site, used during the Riss glacial when the Orontes was again filling its valley with gravels, i.e. when the slightly higher Mindel terrace would offer a safer camping site (cf. the 'rebellious' nature of the river, before it was tamed by dams). The freshness of the artifacts at the surface today may be ascribed to the recent introduction of the deep plough to the area. It is hoped that a sounding can be made, and if the underlying soils are undistributed, the typology found will form a Late Acheulean model for the region. It will also be invaluable for distinguishing between Middle and Late Acheulean artifacts which are sometimes found mixed together (in the Jrabiyate Formation, in cases where the river reworked Mindelian material during the Riss valley-filling period).

6. During the Würm or Weichsel, the Orontes valley was evidently occupied, particularly during the first phase. Several rich sites which must represent an early Middle Paleolithic were discovered in and on terraces of the Saroute Formation (Figs. 12–14). The artifacts had a characteristic grey-blue patina quite different from the chestnut-brown patina of Mindel and Riss assemblages. Certain exposures of the Würm terrace contained reworked Rissian material, such as thin ovate bifaces with chestnut-brown patina (Tahun Samaan 3), but the contemporary industry appeared to consist of light-duty tools and rare Levallois flakes (Tahun Semaan 1). A facies which may be slightly earlier occurs, without geological associations, on the surface of the plateau, in areas where flint seams outcropped. Here, however, a large number of cores and cortex-flakes were also present, suggesting that these sites are factories. The rarity of flakes of Levalloiso-Mousterian type and the presence of the small bifaces (Fig. 2) and irregular 'bifacial pieces' (Fig. 12, 1) suggest that, if this is not an early Middle Paleolithic as at Tahun Samaan 1, then it is a Final Acheulean of Levallois facies.

Some occurrences of this facies, washed down into wadi beds as at Zakat 2 and Zaitiye 2, had black, shiny patina and traces of heating (pot-lid fractures and convex-negative scars) such as might have been caused by forest fires, stubble-burning or the like, at any time in the past.

We name this Final Acheulean facies the Defaian, after Tulul Defai, a rich site near Latamne. We suggest a Riss/Würm date, and note typological connections between it and possibly contemporary facies in Yabroud, Shelter 1, in layers 18, 17, 12 and 11 (Acheulean with Levallois debitage (Bordes, 1955: 490), and see comments of Waechter

(1952: 17)). No trace whatever of Yabrudian artifacts or techniques of flaking were found at this (or at any other) site. In fact, the Defaian techniques resemble those used later on in the 'broad oval Levallois flake' phase of the Levalloiso-Mousterian proper (as this is known from Ras el-Kelb and Naame in Lebanon and from Tabun C in Israel). This facies would, therefore, form a satisfactory precursor to the broad oval Tabun C phase (provisionally called 'Phase 2' by Copeland (1975: 327)) of the Levalloiso-Mousterian, which (perhaps significantly) occurs earlier and more often in Lebanon than in Israel.

As conspicuously absent in the Orontes valley as the Yabrudian is the Levalloiso-Mousterian. Sporadic finds (e.g. of triangular points) suggest that sites exist, as yet unfound (similar finds are mentioned by Clark (1967: 4) from the red calcic colluvium overlying the Mindel terrace near Latamne).

7. No clearly Upper Palaeolithic, Epi-Palaeolithic or Neolithic material was found, although isolated examples of burins, end-scrapers or blades with punctiform butts did occur on recent or colluvial soils. Numerous tells, in varying stages of destruction due to new farming methods, were encountered; although collections were not made, their exact location has been noted.

Conclusions

Although traces of a Pre-Mindel human occupation of the Middle Orontes were found, the small sample of 25 pieces does not permit us to do more than to suggest that it belongs to some kind of Pre-Acheulean and that it is unlike the assemblage of Sitt Markho.

We can now fit the Latamne occurrence into a Pleistocene cultural chronology for the Orontes area; it may have forbears in the Khattab period, and it certainly had at least some influence on the succeeding Jrabiyate phase assemblages. Although we can correlate it chronologically with assemblages in the el-Kebir area, the Latamne Acheulean is typologically very different from its Middle Acheulean contemporary, Berzine (which has no polyhedrons or spheroids, and only rare lanceolate or trihedric bifaces: Sanlaville *et al.*, in press), but it resembles the industries of broadly the same date from Jub Jannine and Ubeidiya, also in the Rift Valley but farther south (Besançon *et al.*, 1970; Bar-Yosef, 1977, respectively). Since Berzine has typological analogues also on the littoral, at Ras Beirut Ib, for example (Fleisch and Sanlaville, 1974), we regard this as demonstrating the existence of cultural variability in the Middle Acheulean of the northern Levant. We were at first inclined to see this as representing two geographically determined 'technical provinces' – one inland, and one on the coast. However, the recently published material of Evron Quarry (Gilead and Ronen, 1977), on the *coast* of Israel, seems (although sparse) to refer to the inland facies, so that another explanation must be sought.

The site-distribution maps seem to indicate that the Latamne Middle Acheuleans inhabited the lip of the plateau rather than the Mindel rivers' flood-plain, particularly at points where affluents joined the main stream (Khattab, Wadi Gharmachi, N. Latamne, etc.).

By the time of the Riss or Saale glacial, the Latamne facies of the Middle Acheulean had vanished, and was replaced by the Late Acheulean, with its ovate and amygdaloid biface forms. It is largely due to the striking difference in biface morphology that we are now able to distinguish Late from Middle Acheulean, a task especially difficult as some traits of the older culture seem to have been inherited by the succeeding one. Our impression is that the biface types of the Late Acheulean are similar all over the Levant, within certain limits.

After the relatively homogenous Riss or Saale material, variability appears again in the Defaian, which does not resemble other Levant assemblages of comparable age known to us; it does resemble the Samokian of the Kebir area in the smallness of its bifaces and in the incidence of Levallois technique but the Samokian has no 'bifacial pieces' or discs. All these Final Acheulean variants (Defaian, Samokian, and the interdigitations of facies farther south, e.g. at Yabrud Shelter I of Yabrudian, Acheulean, Pre-Aurignacian, etc.) seem to us to suggest developments of some sort, perhaps connected with the replacement of *Homo erectus* by *Homo sapiens neanderthalensis*, which should have been occurring at about this time. (Since the Yabrudian has not yet been found north of Yabrud, which is 80 km south of Homs, can we see in the northern Levant the hint of another 'technical province' in Riss/Würm or Eem times, wherein Levallois flaking methods were preferred?)

Further interpretation must be postponed until the material can be studied in more detail, and until the evidence we hope to gain next year can be added to our data-base. (In 1978 we hope to study an arid zone, the Euphrates river terraces between the confluences of the Balikh and Khabour tributaries; Quaternary formations and Palaeolithic artifacts are known to exist (Van Liere, 1960) in both areas.)

The work on the Orontes is part of a three-year project initiated by the last-named author, and supported by the French *Centre National de la Recherche Scientifique* (CNRS), under their *Recherche Cooperative sur Programme* schemes. Our programme is RCP no. 438, and has as its subject: *L'homme et le milieu dans la région levantine au Quaternaire.*

Abstract

Fluviatile terraces in a 100 km stretch of the river Orontes, in the Levant extension of the African Rift Valley, was surveyed by a team of two geomorphologists and two prehistorians. This area includes the location of the unique Latamne Acheulean living-floor, already published. A series of five terraces were discovered and some 4,000 artifacts collected from them. Some previous interpretations as to the chronology are corrected, and we are able to construct a Quaternary chronology for the region, and to follow the evolution of the Acheulean from before the Mindel glacial up until the Riss/Würm interglacial.

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Three small Ivories from Nimrud in the Institute of Archaeology, London

by HOWARD HAWKES

Introduction

Much of the material allocated to the British School of Archaeology in Iraq from the excavations at Nimrud (1949–63), of which the carved ivories are a major component, has been distributed to museums around the world which gave money to the excavation. There remain, in the keeping of the Western Asiatic Department of the Institute of Archaeology, London, a number of fragmented ivories which the Director-General of Antiquities in Iraq assigned to the British School of Archaeology at the annual division of material at the end of each season of excavation. The pieces that appear here all come from a set of drawers labelled 1955, containing low quality material and unidentified burned fragments. The high relief carving illustrated in Plate I, A and B, was found untreated and in a different drawer from the pieces in Plate II, though the 1955 identification makes it extremely probable that all three pieces came from the Nabu Temple on the citadel of Nimrud. The latter examples had been cleaned and, indeed, are marked with a single number 6 (or 9), on an undecorated surface, perhaps indicating their reconstructed positions in relation to other similar pieces, though none was found.

Mention should be made here of an unillustrated piece, similar in shape, dimensions and general condition to Plates I and II, from a box marked 'Long Room, B.P.' in a drawer labelled '1951'. This latter piece had been cracked extensively along a surface containing vague relief figures, the surface equivalent to the one containing the bull processions on Plates I, A, and II, B. Though remains of a design on the surface are difficult to make out there does seem to be the foreparts of a lion facing left with two human feet opposite. On the surface of the opposite burned edge there is a slightly rounded projection (0.15 cm diameter x 0.10 cm), which may be a knob for attachment as it does not appear to have a stem extending into the interior, and therefore cannot be the broken remnant of an ivory peg.

As stated above the ivory pictured in Plate I, A and B, was discovered encased in dirt, only the row of rosettes on the upper surface (Plate I, B), being visible. Careful cleaning under a microscope revealed the high relief procession of bulls, advancing to the right. Parts of two bulls survive on this surface with a plant form consisting of an incised leaf on each of two undulating stems between the animals. The amount of detail con-

Plate IA

Plate IB

Plate IIA

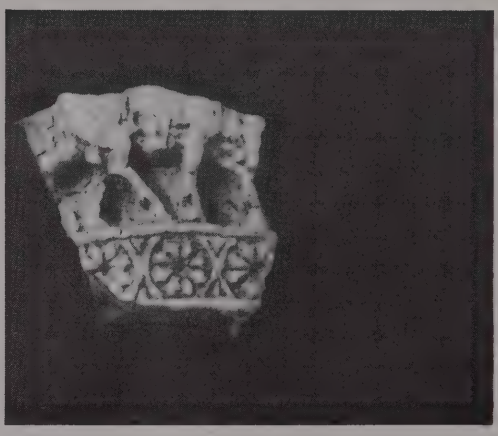

Plate IIB

Ivory carvings from Nimrud (scale: 3/1).

tained in a design of this size is quite surprising. The physical details found on other, much larger, ivory bulls from the same site (Barnett, 1957: S-137A Pl. LXII, S-138A-C Pl. LXII, S-143-E Pl. LXII; Mallowan, 1966: Pls. 550–553) all appear on our examples. The mouth and eyebrow are accurately incised, while along the neck and torso, details of the dewlap, the 'mane', and the ribs are all represented. The bovine hooves are properly carved with fetlocks, the genitals are present, and the end section of the tail appears woven as on examples of the cow and calf motif (Mallowan, 1966: Pl. 426). Even the left hind leg, behind the woven tail section, has been indicated, complete with fetlock. To complete the description of the decoration on this surface, the upper and lower edges are carved with rows of tiny dots in low relief.

The upper surface of Plate I, B, has also been carved. The greater remains are those of a row of eight-petal rosettes. Immediately adjoining the rosettes are the broken remains of two leaf forms like those on the 'A' surface, (Plate I, A) indicating a further design existed in a horizontal plane at right angles to the bull procession. The individual leaves in this design are incised on either side of a central stem, identical to those that appear between the bulls.

The ivory reproduced in Plate II, A, does have a surface equivalent to Plate I, A (~~not illustrated here~~), that originally had a bull procession with alternate plants, in high relief. Fire damage and breakage has made this design very difficult to reproduce photographically. What can be distinguished of the bull procession are the remnants of the fore-parts of a bull on the left, the plant element extending under the bull's muzzle, and a raised vertical line which is all that is left of the vertical stem. The remainder of the procession is missing, and hardly any of the details of the remaining bull's physique are visible. Part of a row of dots survives along the upper edge.

The upper surface (Plate II, A) retains only part of its original design. Breakage along the length of the design has left the neck and the head of a male facing left. Like the bulls on Plate I, A, various features of the male figure's face are clearly defined. In addition, he wears an Egyptian style 'peg' wig much the same as that on the male figure in the open-work 'griffin slayer' plaque from Nimrud (Mallowan, 1966: Pl. 485), though on our example no ear is visible. To the left of the male figure is a solitary up-turned wing with the individual feather areas incised along the length of the wing. This wing may, in fact, be part of a winged sphinx facing left as there are indications, below the wing, of a torso with marked ribs. If this broken design can be interpreted as a winged sphinx then the male head to the right may be the head of the following sphinx in a processional arrangement. Immediately above, in the background, is a plant leaf on a short stem identical to that on Plate II, A. A section of a row of eight-petal rosettes extends along the upper edge of the composition and corresponds exactly to what remains of the dot border on the surface with the bull procession. Any interpretation of the motifs on this surface is very difficult due to the present poor condition of the piece, and even the procession of sphinxes may be questioned.

At present there is only one other example in ivory of human headed sphinxes in procession from Nimrud (Barnett, 1957: Pls. XLVI, XLVII, 5–70), and it appears in low relief on a carved tube in Syrian style. The carving shows little similarity with our example. Like the individual relief and open-work plaques of bulls and cows with calves discussed below it is possible that the many examples of sphinxes that also occur in these forms were arranged in procession on particular pieces of furniture.

Plate II, B, illustrates the final example of these miniature pieces with bull processions. Although slightly larger than the examples mentioned above, less of the original motif survives on this carving. The top half of the major design area is missing so that all that is left is the lower half of a bull walking to the right. Some of the details of the bull's physique are present, as are the remains of a plant stem between the rear legs. Below is a section of a row of eight-petal rosettes whose outline is defined by an elaborate X-shaped

pair of volutes (?) with incised triangles between the spreading bars. This detail of technique for carving rosettes also appears on the other pieces illustrated here, though less visibly. As so much of this piece above the bull is missing it is impossible to determine whether the upper surface had been carved with a corresponding arrangement of figures as on the pieces on Plates I, A, and II, A. The side opposite the bull procession has been badly burned, the black marks extending along the left edge as far as the background of the bull, and along the top edge far enough to indicate that this piece was fractured prior to, or during, the sack of Nimrud and that the breakage was not a result of the excavation or storage of the object.

Bull figures, though fairly common in the various collections of ivory carvings from Nimrud, rarely survive in a processional arrangement. Mallowan (1966: Pls. 125, 551), has published two examples of bulls in procession. ND 7560 (Mallowan, 1966: Pl. 551) shows 'prize' bulls in procession around a burned section of tusk. The head-down posture of these animals characterises the stance of nearly all of the individual examples of ivory bulls. Another piece found by Mallowan, ND 3587 (1966: Pl. 125) in the private houses on the citadel is similar to ND 7560 in that the bull supports a circular moulding, once inlaid, but with none of the incrustation remaining. That this latter figure was 'in procession' is indicated by the presence of the following (now missing) bull's horn on the right haunch of the remaining figure. A curved relief plaque (Mallowan, 1966: Pl. 438), depicts an advancing bull with a horn still attached to his haunch as well as the woven tail-end of the leading bull surviving on the lower right area of the plaque. Though not depicted in the same form as the other examples this piece demonstrates the component nature of most ivory bull figures from Nimrud.

Amongst the unpublished examples of bulls in the collection at the Institute only ND 9640 from Room SW 37 in Fort Shalmaneser depicts them in procession, in this case on a fragmentary rectangular relief plaque with a raised frame. Three other individual bull figures (ND 10598, ND 9538, ND 11004), also from Fort Shalmaneser, have the broken remains of the horn of the following bull still attached to their haunches.

Nearly all the open-work representations of bulls are slightly curved pieces, probably originally intended to be applied decoration to cylindrical objects. The smaller examples of these figures have 'T'-shaped or 'bottleneck' (Barnett, 1957: 155; Figs. 64, 87, Pp. 174, 220) attachment slots on the rear surface, as does one very large model of a bull, ND 762 (Mallowan, 1966: Pl. 53). Other bull pieces have vertical tenons or support plain relief frames (Mallowan, 1966: Pls. 126, 176, 553, and ND 12204, ND 12127 unpublished). The breakage of such a horizontal upper frame can, depending upon the direction of the grain in the ivory, result in a straight break along the top edge of the animal, and is not to be attributed to the object being carved in two pieces (Mallowan, 1966: 584) as there are no examples from Nimrud of bulls, or of cows and calves, being produced by this method.

In discussing the opposed movement of the legs of the large bull, ND 762, mentioned above, Mallowan (1951: 15), notes that this form does not comply with Assyrian artistic convention, and interpreting Thureau-Dangin (1931: 67), suggests as an area of

origin western Syria. It should be noted that the three examples published here, as well as the published and unpublished pieces mentioned above, observe this stance. Another bull from Fort Shalmaneser, ND 7594 (Mallowan, 1966: Pl. 553), presently in the Royal Ontario Museum, Toronto, is described as 'browsing on vegetation'. The detail and positioning of the plant form on this work is identical to that on Plate I, A, and on the unillustrated side of Plate II, A, though it is by no means certain that the animal is browsing in the same sense as the stags or oryx on open-work plaques from the same site Mallowan, 1966: Pls. 435, 439, 471).

The similarities that exist between the bull procession and individual open-work bull figures with the cow and calf pieces from Nimrud are very strong. Though the composition of the two ranges of figures is different the detailed carving of facial, torso, and limb elements are, in most cases, identical. In addition, the use of overhanging frames and bottle-neck slots is common in both groups. Although there are no published examples of the cow and calf motif used in a processional assemblage, two unpublished relief plaques (ND 12212, ND 12225), at the Institute depict just such an arrangement. When describing two open-work cow and calf representations Mallowan (1966: Pls. 436, 437), states that 'thousands of similar plaques must have been carved', and many 'adorned the same article of furniture' indicating that it was highly probable that a processional grouping arrangement extended to the range of cow and calf figures also. Indeed, at Arslan Tash (Thureau-Dangin, 1931: Pls. XXXVII–XLIII), the examples of the cow and calf motif, identical to many Nimrud pieces, make up a large percentage of the entire collection of ivory carvings.

The relationship of suckling goddesses to the symbolism of the cow and calf has been traced by Dr Barnett to the very early periods of Western Asiatic art (Barnett, 1957: 143–5), and is reflected in many Canaanite and Mesopotamian religious concepts in succeeding periods. The lack of excavations at contemporary levels in major cities make it impossible to determine how this motif would have been rendered by a native Phoenician ivory craftsman. Perhaps the examples of bull and cow and calf carvings we have today are of Phoenician origin, for certainly both sets of animals figure strongly in their religious iconography (Barnett, 1957: 144–5), but to date there is no absolutely concrete archaeological proof to support this assumption. It is generally assumed (Winter, 1976: 2), that the native Phoenician style contained stronger Egyptianising elements than similar forms from the Syrian interior. Barnett (1957: 144) states that this subject occurs in Phoenician art first in these (Nimrud) and the closely related ivories of Arslan Tash, as cow and calves only occur, among the early collections from Nimrud, in the Layard group with its strong Egyptian influences. Barnett identifies this group as being Phoenician in style (1957: Pl. V). Mallowan, as stated above, saw a western Syrian origin for the large open-work bull piece and a north Syrian origin for the cow and calf on stylistic similarities to the Arslan Tash cow and calf group (Mallowan, 1966: 526). It is the author's opinion that the bull processions illustrated here may reflect a transitional style to the immediate Syrian interior and are not to be considered as strongly north Syrian in style. A similar idea is implied by Irene Winter in discussing sphinx figures (Winter, 1976: 7).

For bull forms this principle can best be seen by comparing the details of the bulls represented on ivory furniture panels from room SW 7 in Fort Shalmaneser (Mallowan, 1966: Pls. 416–17) which are considered to be north Syrian in origin, and the examples published here and elsewhere. It is not impossible that the examples we have discussed here have been carved by travelling Phoenician ivory craftsmen working in Syrian cities.

Figures of bulls appear rarely in the other major ivory-producing sites of Mesopotamia and the Levant. Usually, however, these take the form of combat scenes with the bull attacked by a lion or griffin, or both (Crowfoot, 1938: Pl. X, 1 and 2). This combination is also found at Nimrud on pyxis pieces (Barnett, 1957: Pl. XXVI, S-5), and on furniture panels and a low relief plaque from Fort Shalmaneser (Mallowan, 1966: Pls. 416–17, 552).

The three rectangular ivory carvings illustrated in this report must surely be among the smallest examples decorated with figures in relief from the ancient Near East. The author knows of no other ivory objects carved in such fine detail on two surfaces to this scale. Due to their fragementary condition any suggestion as to the original function of this type of ivory must be speculative, though the possibility of these pieces being bands of rim (pyxis?) decoration should not be ruled out through lack of parallel examples. Whatever the original usage may have been the minute details of carving delineating the facial features, the woven tail, the vegetal elements, and the delicate rows of rosettes, must reflect a true mastery of the ivory workers craft.

Catalogue

Fragment of a slightly curved high relief piece. Dimensions: 1.90 cm x 0.8 cm x 0.5 cm. Carved on two surfaces. Side A: Remains of a procession of bulls to the right. Plant form between the bulls with two undulating branches and individual leaf forms incised. One stem curves horizontally under the muzzle of the following bull, the other rises vertically. Facial details, dewlap, ribs, mane and genitals finely carved. Tail ends in a 'woven' pattern. Border of dots along upper and lower edges. Side B: Top surface area has row of eight-petal rosettes with volute and triangle separations between. Behind border of rosettes remains of top parts of three leaf elements. This design at 90° to 'A' surface. Parts of rear surface burned and whole piece cracked in many places. 9th to 7th centuries BC. (Plate I, A and B).

Fragmentary slightly curved high relief piece. Dimensions: 1.55 cm x 1 cm x 0.7 cm. Carved on two surfaces. Side A: Not illustrated. Remains of bull advancing to the right. Section of plant stem and leaf under muzzle of bull. Border of dots along part of upper edge. Surface badly burned and broken. Side B: Row of eight-petal rosettes with volute and triangle separations. Below rosettes at right is male figures head, with incised facial features and Egyptian wig, facing left. To the left are remains of an upturned wing with incised feather areas over a torso of a sphinx (?), also facing left. Ribs marked on sphinx body. Above is a plant leaf with a central stem. A number 6 (or 9) appears in brackets on the bottom edge. Extensively burned and broken. 9th to 7th centuries BC. (Plate II, A).

Fragment of a slightly curved high relief piece. Lower half of a bull advancing to the right. Dimensions: 1.15 cm x 1.05 cm x 0.9 cm. Dewlap, ribs, mane and genitals present. Remains of stem of plant between rear legs. Row or eight-petal rosettes with volute and triangle separations below. A number 6 (or 9) appears on bottom surface. Extent of breakage makes it impossible to determine if any other surfaces were carved. Extensively burned. 9th to 7th centuries BC. (Plate II, B).

Abstract

The ivory carvings allocated to the British School in Iraq from the excavations at Nimrud are stored in the Department of Western Asia at the Institute of Archaeology, London. All the pieces illustrated here come from a set of drawers labelled 1955, containing low quality material and unidentified burned fragments. The carving shown in Plate I, A and B, was discovered untreated in a tray separate from that containing the carvings of Plate II, though it is probable that all three pieces came from the Nabu Temple on the citadel. The primary relief decoration consists of bull processions with alternating plants between edge-decoration of rosettes and borders of dots. Two pieces (Plates I, B, and II, A) show remains of relief carving along an upper surface, possibly of a procession of winged human headed sphinxes and similar plants. The extremely delicate and detailed carving of the figures and the arrangements of figures in processional form find strong parallels among much larger examples of the same subject in ivory from Nimrud and various ivory workshops in other Near Eastern cities.

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Towards an understanding of Flint Industries in Post-Glacial England

by M. W. PITTS[1]

Introduction

I have elsewhere considered approaches to the study of lithic flake debitage in Europe, and emphasised the potential of examining the breadth : length ratio distribution of unretouched assemblages (Pitts, 1978). This method will be well known to most British prehistorians, especially, perhaps, through its recent application by Dr G. J. Wainwright (Wainwright and Longworth, 1971; Wainwright, 1972; Wainwright, forthcoming). Probably less well known is similar work carried out in northern Italy by Bagolini and others (Bagolini, 1968). The results of this work in both southern England and northern Italy are analysed with multivariate techniques in the article referred to above. The aim here is to examine the background to the English data, consider the results of their analysis in greater detail and to look at the divisions of the period in the light of these. In conclusion, a model for change in flint industries during the post-glacial is proposed.

The more speculative points in this article are intended as much to provoke discussion as to provide a permanent structure for study of the material in hand. The framing of explanatory hypotheses makes one immediately aware of the inadequacies of the data. The major limiting factor is not an inherent condition of these data, however, so much as the nature and depth of their recording and analysis to date.

Background to the flake measurements

About half of the assemblages included in these analyses are, at the time of writing, previously unpublished (Fig. 1 and Table 1). The most comprehensive application of the method to date (although not the earliest: cf. Mace, 1959; Alexander *et al.*, 1960; Clark, 1961) remains that of Isobel Smith (1965). In what follows, Smith's conventions are treated as standard.

Smith (1965: 68) constructed her diagrams 'to obtain information about knapping techniques as represented by by-products'. This is the only explicit statement of purpose

[1] Main text completed September 1977.

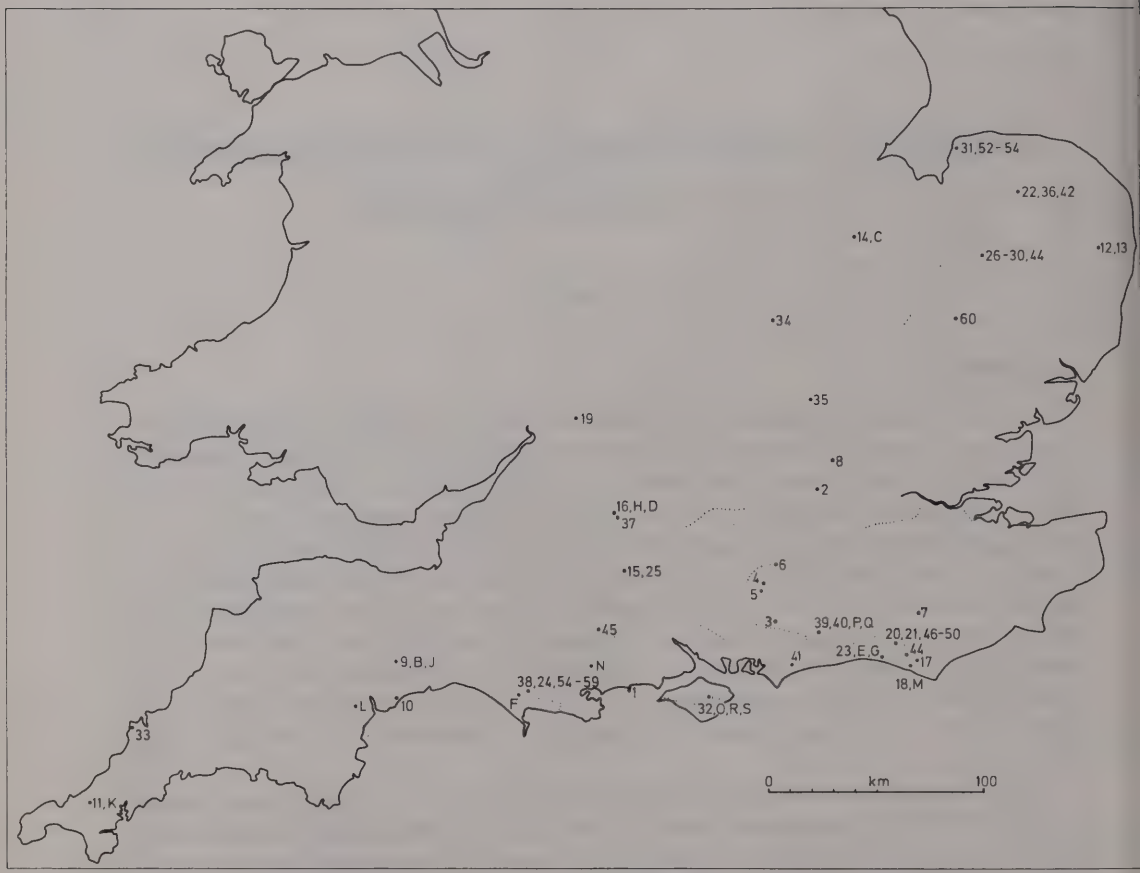

Fig. 1 Location of sites. Dotted lines indicate generalised occurrence of Chalk. For key to all diagrams, see Table 1.

that has yet appeared, though it is clear from the way in which the results are generally used that the motive is usually one of describing the 'overall morphology' of an assemblage (Derricourt and Jacobi, 1970: 3) and at the same time of bolstering the chronological implications of the retouched implements (not infrequently few in number).

Smith measured unbroken waste flakes, and she appears to have been generally followed. Occasionally used flakes are also included (Connah, 1965; Drewett, 1975). Phillips (1973) seems to have measured all flint artefacts, so her figures are irrelevant to this study. Smith included used and serrated flakes for the Pamphill calculations because of the small size of the sample (Field *et al.*, 1964), while Bell (forthcoming) included all retouched pieces whose shape was unmodified. The latter's figures have been recalculated

Table 1 Key to assemblages. A: Flake assemblages

No.	Name	No. flakes in sample	C_{14} determination, years bp (1950)	Projectile head associations: M, microlithic L, leaf point T, 'tranchet derivative' B, barbed and tanged	Pottery	Stage	Source
1	Hengistbury Head	307				Upper Palaeolithic	Mace, 1959
2	Sandstone, Iver	215		M		Early Mesolithic	Author (cf. Lacaille, 1964)
3	Iping (site II)	267		M		Early Mesolithic	Author
4	Kingsley Common (site 38)	125		M		Early Mesolithic	Author (cf. Clark and Rankine, 1939: 114)
5	Oakhanger Warren (site V)	251	9040 (av. six dates)	M		Early Mesolithic	Author (cf. Rankine, 1952)
6	Farnham (Pit II, spit 2)	250		M		Later Mesolithic	Author (cf. Clark and Rankine, 1939)
7	Hermitage Rocks (1975 excavations)	142	6800 ± 110 (Q1312)	M		Later Mesolithic	Author (cf. Tebbutt, 1974: 41)
8	Hampermill	170				Later Mesolithic	Derricourt and Jacobi, 1970
9	Hembury	685	5280 ± 150 (BM-138) 5190 ± 150 (BM-136) 5100 ± 150 (BM-130)	L (numerous)	Hembury	Early Neolithic	Whittle, 1976 (cf. Liddell, 1935)
10	High Peak	280	4810 ± 150 (BM-214)	L (3)	Hembury	Early Neolithic	Pollard, 1966
11	Carn Brea	250	4999 ± 64 (BM-825) 4697 ± 60 (BM-824) 4561 ± 47 (BM-823)	L	n.a.	Early Neolithic	Whittle, 1976 (cf. *Current Archaeology*, 4: 1975: 360–5)
12	Broome Heath (old land surface)	1,020	5424 ± 117 (BM-679) 4167 ± 78 (BM-755)	L (1)	Grimston/ Lyles Hill	Early Neolithic	Wainwright, 1972
13	Broome Heath (pits)	528	4579 ± 65 (BM-757) 4523 ± 67 (BM-756)	L (6)	Grimston/ Lyles Hill	Early Neolithic	Wainwright, 1972
14	Fengate (Padholme Road, Area XIII)	90	4960 ± 64 (Gak-4196) 4395 ± 50 (Gak-4197)		Grimston	Early Neolithic	Pryor, 1974
15	Durrington Walls (old land surface)	290	4400 ± 150 (NPL-191)	L (1)	(cf. Windmill Hill)	Early Neolithic	Wainwright and Longworth, 1971
16	Windmill Hill (primary ditch levels)	1,443	4530 ± 150 (BM-74)	L (*c.* 15)	Hembury, Abingdon Ebbsfleet	Early Neolithic	Smith, 1965
17	Alfriston (primary ditch silts)	545	4310 ± 110 (Har-940)			Early Neolithic	Author (cf. Drewett, 1975)
18	Bishopstone (pit 357)	593	4460 ± 70 (har-1662)	L (2)		Early Neolithic	Bell, forthcoming
19	Crickley Hill	408		L	Devolved Hembury	Early Neolithic	Burton, unpublished (cf. Dixon, 1971)
20	Offham (primary layers)	2,356		L		Early Neolithic	Drewett and James, unpublished

Table 1 Key to assemblages. A: Flake assemblages (contd)

No.	Name	No. flakes in sample	C_{14} determination, years bp (1950)	Projectile head associations: M, microlithic L, leaf point T, 'tranchet derivative' B, barbed and tanged	Pottery	Stage	Source
21	Offham (secondary layers)	981		L		Early Neolithic	Drewett and James, unpublished
22	Spong Hill (Group 1)	247		L	Mildenhall	Early Neolithic	Healy, unpublished
23	Whitehawk	432		L (2) T (1)	Hembury, Ebbsfleet, Grimston/ Lyles Hill	Early Neolithic	Whittle, 1976 (cf. Curwen, 1936)
24	Mount Pleasant (old land surface)	592	4072 ± 73 (BM-644)	T (3)	Hembury	Late Neolithic	Wainwright, forthcoming
25	Durrington Walls (Southern Circle)	1,650	3950 ± 90 (BM-396) 3900 ± 90 (BM-395) 3850 ± 90 (BM-397) 3760 ± 148 (NPL-239)	T (41) B (2)	Grooved Ware	Late Neolithic	Wainwright and Longworth, 1971
26	Grime's Graves (F 117, layer 5, Chipping Unit II)	203				Late Neolithic	Burton, unpublished (cf. Sieveking *et al.*, 1973)
27	Grime's Graves (T3)	780			Grooved Ware	Late Neolithic	Saville, unpublished (cf. Mercer, 1976)
28	Grime's Graves (T4)	1,360			Grooved Ware	Late Neolithic	Saville, unpublished (cf. Mercer, 1976)
29	Grime's Graves (T2A)	200				Late Neolithic	Saville, unpublished (cf. Mercer, 1976)
30	Grime's Graves (1971 shaft)	200				Late Neolithic	Saville, unpublished (cf. Mercer, 1976)
31	Redgate Hill	518	3686 ± 63 (BM-704)	T	Grooved Ware	Late Neolithic	Healy, unpublished (cf. HMSO, 1972: 10–11)
32	Arreton Down	1,274		T (3)	Late Peterborough	Late Neolithic	Alexander *et al.*, 1960
33	Booby's Bay	386		T (7)		Late Neolithic	Whitehead, 1973
34	Ecton	306		T (2)	Mortlake	Late Neolithic	Moore *et al.*, 1975
35	Puddlehill	121		T (1)	Grooved Ware	Late Neolithic	Field *et al.*, 1964
36	Spong Hill (Group 3)	318				Late Neolithic	Healy, unpublished

37	West Kennet Avenue	1,383		L (1) T (89) B (7)	Ebbsfleet, Mortlake, Fengate	Late Neolithic	Smith, 1965
38	Mount Pleasant (all Chalcolithic contexts)	4,534	3891 ± 66 to 3459 ± 53	T (6) B (2)	Grooved Ware and Beaker	Chalcolithic	Wainwright, forthcoming
39	Rackham (Area I)	*c.* 350		B (1)		Chalcolithic	Holden and Bradley, 1975
40	Rackham (Area II)	*c.* 340	3950 ± 140 (Har-360)	B (2)		Chalcolithic	Holden and Bradley, 1975
41	North Bersted	78			Beaker	Chalcolithic	Author
42	Spong Hill (Group 2)	342				Bronze Age	Healy, unpublished
43	Itford Hill (Depression C)	145				Bronze Age	Holden, 1975
44	Grime's Graves (T8B)	1,594				Bronze Age	Saville, unpublished
45	Oakley Down	'several hundred'				Bronze Age	White and Reed, 1971
46	Offham, Flint Concentration 2	518				Early Neolithic	Drewett, 1977
47	Offham, F.C. 3	445				Early Neolithic	Drewett, 1977
48	Offham F.C. 4	146				Early Neolithic	Drewett, 1977
49	Offham, F.C. 5	120				Early Neolithic	Drewett, 1977
50	Offham, F.C. 7	105				Early Neolithic	Drewett, 1977
51	Redgate Hill, pit 12	108				Late Neolithic	Healy, unpublished
52	Redgate Hill, pit 20	167				Late Neolithic	Healy, unpublished
53	Redgate Hill, pit 21	104				Late Neolithic	Healy, unpublished
54	Mount Pleasant, enclosure ditch (north entrance), layer 10	310	3891 ± 66 (BM-791)			Chalcolithic	Wainwright, forthcoming
55	Mount Pleasant, enclosure ditch (north entrance), layer 8	300	3619 ± 55 (BM-790)			Chalcolithic	Wainwright, forthcoming
56	Mount Pleasant, enclosure ditch (north entrance), layer 7	878	3459 ± 53 (BM-789)			Chalcolithic	Wainwright, forthcoming
57	Mount Pleasant, enclosure ditch (north entrance), layer 6	796	3506 ± 55 (BM-788)			Chalcolithic	Wainwright, forthcoming
58	Mount Pleasant, palisade trench III, layer 3	850	3645 ± 43 (BM-665)			Chalcolithic	Wainwright, forthcoming
59	Mount Pleasant, Site IV, secondary silts	1,400	3630 ± 60 (BM-668)			Chalcolithic	Wainwright, forthcoming
60	Barrow Bottom, Risby	486				Bronze Age	Martin, 1976

Table 1 Key to assemblages. B: Tool assemblages

Label	Name	No. pieces	Description	Source
B	Hembury	120	Used flakes, 'Class A'	Whittle, 1976
C	Fengate (Padholme Road, Area XIII)	81	Used flakes, 'Class A'	Pryor, 1974
D	Windmill Hill (primary ditch levels)	414	Used flakes, 'Class A'	Smith, 1965
E	Whitehawk	149	Used flakes, 'Class A'	Whittle, 1976
F	Maiden Castle	70	Serrated flakes	Whittle, 1976 (cf. Wheeler, 1943)
G	Whitehawk	186	Serrated flakes	Whittle, 1976
H	Windmill Hill	627	Serrated flakes	Smith, 1965
J	Hembury	259	Scrapers	Whittle, 1976
K	Carn Brea	71	Scrapers	Whittle, 1976
L	Haldon	77	Scrapers	Whittle, 1976 (cf. Willcock, 1936)
M	Bishopstone	95	Used and retouched flakes, shape substantially unmodified	Bell, forthcoming
N	Pamphill	70	Unused, used and serrated flakes	Field *et al.*, 1964
O	Arreton Down	1,183	Used flakes	Alexander *et al.*, 1960
P	Rackham (Area I)	*c.* 150	Used flakes	Holden and Bradley, 1975
Q	Rackham (Area II)	*c.* 160	Used flakes	Holden and Bradley, 1975
R	Arreton Down	99	Scrapers	Alexander *et al.*, 1960
S	Arreton Down	196	All retouched pieces	Alexander *et al.*, 1960

by the writer to exclude all but unused waste. Healey (in Ketteringham, 1976) records the ratio scores for four different groups. Each of these is small in size, and the collection is very damaged and possibly mixed: her results have not been used here. Froom (1973 and elsewhere) records only 'blades': his figures are also excluded. A few writers have computed breadth : length ratios for used flakes and retouched pieces separately; the results of these calculations will be considered below.

The variables have been defined by Smith (1965: 81) as follows: 'length' is the greatest dimension along the axis of percussion, and 'breadth' the greatest orthogonal dimension, with the rider that breadth is, 'in practice, the breadth of the rectangle into which a flake will fit when its bulbar axis is aligned with the long axis of the rectangle' (Field *et al.*, 1964: 360). Connah (1965: 15) and Whittle (1976: 116) have given similar definitions (and Pryor's terms (1974: 13) are probably synonymous). The Ozannes worked with a slightly different system, defining 'length' as 'the greatest dimension at right angles to the striking platform', and 'breadth' as 'the greatest dimension parallel to the platform' (Alexander *et al.*, 1960: 287). Mace (1959: 258) defined length and breadth without reference to the axis of percussion, so that strictly speaking her figures are not comparable. However, the assemblage on which she reported was strongly blade-like, and since her method differs mostly when it comes to measuring flakes whose breadth (as defined by Smith) is greater than their length, it seems fair to include her results in the

general analysis presented here. There are no further references to the method used, but it seems that Smith's definitions have been generally adopted.

Following Smith, most of the analyses have been presented as histograms, giving the percentage scores for the various length, breadth and breadth : length categories (cf. Fig. 1a, c and d, in Pitts, 1978). However, there is considerable variation. Mace (1959) and Derricourt and Jacobi (1970) give the ratios for length : breadth, while Connah (1965) and Whitehead (1973) claim to do this, but in reality, apparently, conform to the breadth : length formula. Derricourt and Jacobi differ in using absolute numbers rather than percentages. Phillips (1973), Froom (1973) and Holden (1975) draw scatter diagrams. Bradley (in Holden, 1972) appears to have derived ratio scores from the length and breadth histograms, which, if this is correct, clearly invalidates his results. Green (1975) and Healey (in Jackson, 1976) seem to have carried out a similar procedure, working from numerated matrices; again, no meaningful ratios can be derived. The Ozannes also presented their data in tables, using a smaller than usual interval of 0.1, and for length : breadth ratios rather than for the other way round. It is not possible to convert these exactly to the standard ratio classes, but the resultant inconsistencies are thought to be small enough to merit the inclusion of this assemblage.

Few reports have followed Smith's example of giving the actual scores as well as the drawn histograms (though Holden and Bradley (1975) have dispensed with the latter, giving the percentage scores alone). For these, scores for use in this study have been taken directly from the histograms. When calculating these, a maximum error margin of ±1.5% over the total was permitted. Two diagrams failed to meet this requirement: that for Stratton-on-Fosse (Gardner and Haldon, 1974; summing to 130%) and that for Maiden Castle (Whittle, 1976; summing to 93.5%).

Also excluded from the ensuing analyses are the assemblages from Knap Hill (Connah, 1965) and from Chaldon Down (Palmer, in White, 1974) which appear to be mixed. During initial work on this topic, the Alfriston assemblage (Drewett, 1975) consistently remained at an unexpected distance from all other assemblages. The flakes from this site have been remeasured by the writer. It appears that the difference between the published diagram and the newly obtained figures is to be largely accounted for by errors in the location of the scale along the base of the histogram (pers. comm., P. Drewett). A smaller factor, but clearly significant, lies in the fact that broken flakes as well as whole were measured (thus the sample is reduced from 900 to 545). The assemblage from Handley (White, 1970) has been omitted as it is undated. For completeness, Alexander (1962) noted that he had calculated 'length and breadth indices' for a Mesolithic assemblage, but no figures are given or available with the stored finds.

Results of the analyses

Only one previous attempt to analyse even some of this work is known to the writer. Pike and Bradley (1974) tried to map sites by using a site similarity matrix as a basis for geographical triangulation. Their negative conclusions differ from those arrived

at with the methods used here, thus supporting the worth of multivariate techniques. These consisted of principal axis and cluster analyses, as described in Pitts (1978). It will suffice here to say that the scatter diagrams tend to have a rough inverted crescent pattern. Assemblages at the upper left extreme are dominated by narrow flakes or blades, while those at the opposite end are characterised by a high proportion of broad flakes. Figs. 2 and 3 are based on essentially the same data as similar diagrams in Pitts (1978) – the difference in this respect being the addition of one site (no. 60). The visual disparity lies in the symbols used, which are dependent on the 'Stages' defined. In Pitts (1978) the traditional Stages are conformed to (apart, perhaps, from the reference of assemblages with actual or inferred Beaker pottery associations to a Chalcolithic), and the sites are

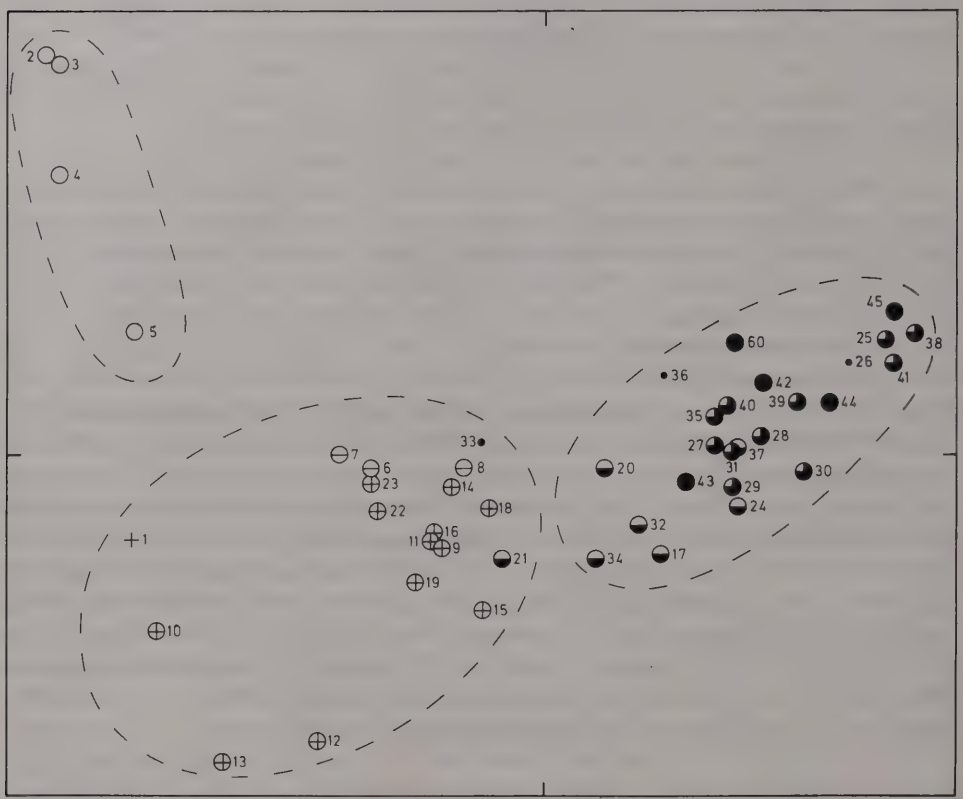

Fig. 2 Flake assemblages plotted on first two principal co-ordinates (92%: 71, 21 [i.e. diagram contains 92% of total variance, of which first co-ordinate accounts for 71% and second for 21%]). Dashed lines indicate groups formed at three cluster level (see Fig. 3). + Palaeolithic, ○ Early Mesolithic, ⊖ Later Mesolithic, ⊕ Early Neolithic, ◒ Late Neolithic, ◕ Chalcolithic, ● Bronze Age, • unclassified. For explanation, see text.

Fig. 3 Cluster diagram of flake assemblages. Symbols as Fig. 2.

listed in this way in Table 1A. The additional distinction between Fig. 3 and the previously published cluster diagram is that the scale of the former has not been long-transformed. This places greater visual emphasis on the basic partition into three clusters.

These three clusters, corresponding to the Early Mesolithic, the Later Mesolithic and Early Neolithic, and the Late Neolithic and after, respectively, appear to result from major realignments in the lithic reduction process, leading in both cases to a fall in the relative quantity of narrow flakes or blades produced. This is shown clearly by the average percentage of flakes in an assemblage falling into the six ratio classes for each cluster:

Cluster	No. of assemblages	Breadth : length classes <0.2	0.2–0.4	0.4–0.6	0.6–0.8	0.8–1.0	⩾1.0
Early Mesolithic	4	2	43	27	13	6.5	9
Later Mesolithic and Early Neolithic	18	0.5	12.5	32	26.5	14.5	14
Late Neolithic and later	24	0	3	16	25	23	33

The first shift occurred at about 6850 bc, and is associated with a change in at least the microlithic component of the retouched tools. The second occurred in the mid-third millennium, and is again associated with a change in the retouched assemblages: in this case, the replacement of the bifacially flaked leaf-shaped projectile point with the range of 'tranchet derivative arrowheads' is the most noticeable instance. The opening of the Neolithic, which saw the introduction of a new technological tradition, is not unambiguously reflected in these diagrams. For the present, the similarity between the Later Mesolithic and Early Neolithic assemblages is probably best treated as coincidental, although it may appear that an ultimately common ancestry of the industries lies behind it. It seems that a likely mechanism for this change in the flake assemblages was a fall in the attention devoted to core preparation. Well-prepared cores in Later Neolithic or Bronze Age assemblages, for example, are extremely rare. An increase in the ratio of flakes to cores during both the Mesolithic and Neolithic periods suggested by Bradley (1971, 1970: 346) may, if valid, be a reflection of this process.

Lengths

The cluster and principal co-ordinates analyses were carried out on 21 assemblages described by their scores on seven length classes (10–20 cm, 20–30 cm, etc.). No groupings were discovered which could be given any apparent archaeological meaning. One reason for this may be the obvious inadequacy of length alone as a characterisation of a flake's size. An alternative system in use on the Continent is referred to in Pitts (1978) but it may be that the best method would be simply to use weight as a criterion (assuming uniform density of the raw materials). Whatever the case, size would seem to be basically a regional factor, and not to be really understood without detailed knowledge of potential and exploited resources (unless, of course, extremes exist – as for example in Later Mesolithic Pennine assemblages, where pieces are exceptionally small; or again, in late glacial assemblages, such as that from Sproughton (Wymer and Rose, 1976) where pieces are characteristically large). An interesting consideration of the significance of variation in the size of stone *tools* is that of Marks (1968: 293–6).

Within-site variation

A study was conducted for three sites with more than one discrete flint assemblage. Two other sites were included for comparison (Fig. 4). Reference should also be made to Fig. 2, where three sites are represented by two or more roughly contemporary assemblages: Broome Heath (12–13), Grime's Graves (26–30) and Rackham (39–40). In this analysis, nine classes were scored, the ninth being breadth : length $\geqslant 1.8$.

That a single site can have assemblages which differ significantly from each other is what common sense would lead one to expect. In this case, all of the sites in hand (except for Rackham and Redgate Hill) have at least two assemblages which are distinguishable

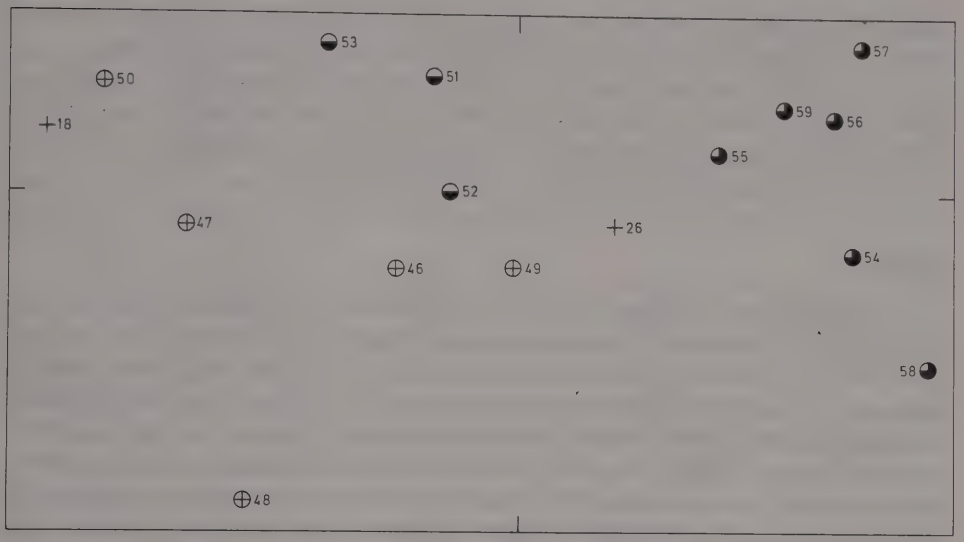

Fig. 4 Within-site variation. Principal co-ordinates analysis (83%: 70, 13). ⊕Offham, ◒Redgate Hill, ◕ Mount Pleasant, + other sites.

from each other (using χ^2 tests) at a significance level of 1%. There seems to be a general feeling that flake samples need to be fairly large, those of between about 150 and 300 flakes being borderline (cf. Field *et al.*, 1964: 360; Pollard, 1966: 49; Bradley in Holden, 1972: 95; Moore *et al.*, 1975). However, if a statistically significant difference exists between two samples, their size is largely irrelevant: explanations can only be offered if the samples' context is well defined. A few examples will illustrate this point.

At Offham, where all of the 'flint concentrations' come from the primary levels, the two from the inner pair of ditch rings (49 and 50) are statistically different at the 5% level ($\chi^2 = 11.1$, with five degrees of freedom). The good context of these 'concentrations' allows one to offer reasonable explanations for the variation. The samples are not too far removed from the knapping process. The two samples from Broome Heath are also statistically different, this time at the 1% level ($\chi^2 = 13.6$, with four degrees of freedom). In this case however, it is difficult to suggest an explanation for this on the available evidence. However many flakes are measured (both of the Broome Heath samples being already considerably larger than Offham clusters 5 and 7), the uncertainty surrounding the chronological and functional relationships between samples 12 and 13 remains.

On the other hand, large bulked samples may be able to provide potentially interesting information. At Mount Pleasant, it is only the latest of the four enclosure ditch layer samples that differs significantly from the Site IV assemblage ($\chi^2 = 14.3$, with seven degrees of freedom, significant at the 5% level). A greater difference exists, however, between the latter and the apparently contemporary Palisade sample ($\chi^2 = 59.2$,

with seven degrees of freedom, significant at the 0.1% level). In this case, the general contexts are sufficiently meaningful to suggest possible reasons for the difference.

In this study, interest is directed at the general pattern presented by a large group of sites. This automatically disposes of arguments questioning the suitability of any one particular assemblage: whether this be on the grounds of small sample size, or uncontrolled sampling from the residue of a many-faceted industry.

Mesolithic

The basic binary division of this period deriving from typological study of microliths (Jacobi, 1976; Mellars, 1976) is confirmed. The respective locations of the Early and Later Mesolithic sites in Fig. 2 indicate a greater production of long, narrow flakes or blades in the older stage. This pattern makes the use of the 'Broad' and 'Narrow Blade' labels (e.g. Mellars, 1976) a source of potential confusion. The derive from a description of microlith types, which are generally larger (hence 'Broad Blade') in the Early Mesolithic. As we have seen, in terms of the overall technology, 'Broad Blade' would in fact be more applicable to the *Later* stage. Work is in progress to examine the validity of this division with the addition to the analysis of further sites, and data relating to core preparation and retouched elements (Pitts and Jacobi, forthcoming).

Neolithic and Chalcolithic

With the appearance of radiocarbon determinations for the British Neolithic, it soon became clear that Piggott's chronological scheme (Piggott, 1954) was unacceptable. Despite an initial reaffirmation of its relevance (Clark and Godwin, 1962), the idea of a Middle Neolithic has been gradually losing currency. Smith (1974) has proposed that it be dropped, suggesting, modestly 'for immediate purposes', a division into an earlier and a later phase. By reinvoking this system here, if under different names, the intention is to suggest that it may still be meaningful. The truth is that our knowledge is too thin to enable one to be dogmatic. If nothing else, then, this draws attention to this gap. In the proliferation of hypotheses lies the health of our discipline.

To begin with the Early Neolithic (as defined by Smith, 1974), no strong chronological trend can be seen (Fig. 2). Hembury (9), for example, the earliest dated site, is very close to Windmill Hill (16), a site some 500 radiocarbon years younger. A similar observation has been made for an earlier period by Jacobi (1976: 67) who has noted that there is 'no consistent typological *evolution* [in the microlithic component] over the 1,500 years time span' of the Early Mesolithic. The extreme locations of the High Peak (10) and Broome Heath (12–13) groups is difficult to explain. The more central positions of Hembury and Carn Brea (11), equally early sites, militate against a simple temporal cause. It may turn out, however, as further assemblages are analysed and accurately dated, that some of the earliest Neolithic sites will group together characterised by waste assemblages containing relatively more narrow flakes than Later Mesolithic ones.

The remaining assemblages have been classified in Figs. 2 and 3 as Late Neolithic, Chalcolithic or Bronze Age. The last category requires no explanation. Taking up Hawkes' lead (Hawkes, 1960), I have described as Chalcolithic those assemblages falling into that period that begins with the appearance of Grooved Ware, and ends when the Bronze Age starts. This complicated span in our prehistory is gradually acquiring a status that defies any simple subdivision. It undoubtedly saw a number of changes in material culture, but few that can be seen to have occurred simultaneously: in terms of *artefacts*, it is a period of vitality.

Four of the assemblages I have referred to as Late Neolithic (Alfriston, 17; Offham, 20–21; Mount Pleasant – old land surface, 24) undoubtedly pre-date this stage, but are equally out of place in a typical Early Neolithic context. At Mount Pleasant, plain bowls are associated with tranchet derivative projectile heads. The Alfriston and Offham assemblages are poor in diagnostic artefacts, but both are clearly separate from the Early Neolithic sites on the basis of their waste flint flakes. Smith (1974, as in her unpublished doctoral thesis) has emphasised the lack of good Peterborough groups. While acknowledging that none can be considered as completely uncontaminated, the three assemblages from Arreton Down (32), Ecton (34) and West Kennet (37) have also been labelled as Late Neolithic. Of these six sites, only Alfriston and Mount Pleasant have C_{14} determinations, at 2360 bc ±110 and 2122 bc ± 73, respectively. It seems worth echoing a point made by Wainwright and Longworth (1971: 259), namely that Peterborough 'assemblages' are distinguished by at least one general flint 'type', the 'tranchet derivative arrowhead'. By grouping the classes of Clark's pioneer classification of these pieces (Clark, 1935) into three functional types, it becomes clear that these have significantly different associations with Peterborough and Grooved Ware pottery (Table 2). The undeniable difference between these two ceramic associations suggests that such a thing as a 'Peterborough assemblage', although not yet adequately defined, does none the less exist. One reason for the apparent elusiveness of pure Peterborough sites may be the lack of communal construction works pioneered by the users of this type of pottery. The selective excavation of sites exposed by farming activities may contain the answer to this problem.

Table 2 'Petit tranchet derivative' projectile heads

Ceramic association	Chisel-ended (A, B, C)	Transitional (D)	Pointed (E, F, G, H)	No.
Grooved Ware	8	16	76	143
Peterborough	54	37	9	130

The percentages of three main types of 'petit tranchet derivative' projectile heads (after Clark, 1935) associated with the two main classes of Late Neolithic pottery. Sources: 1. Grooved Ware. Wainwright and Longworth, 1971 (excluding West Stow, a surface site); Manby, 1974 (Boynton, Yorks.). 2. Peterborough. Clark, 1935 (The Sanctuary); Alexander *et al.*, 1960 (Arreton Down); Smith, 1965 (Windmill Hill and West Kennet); Moore *et al.*, 1975 (Ecton).

Fig. 2 shows that the heuristic device of a Late Neolithic as distinct from a Chalcolithic finds support in the shape of waste flint flakes. The broad logical trend of the scatter diagram is from older to younger sites. The Late Neolithic assemblages, as defined here, fall between the Early Neolithic on the one hand, and the Chalcolithic and Bronze Age on the other. This result is sufficiently encouraging to make the excavation and analysis of further flint assemblages an important aim.

Bronze Age

The five Bronze Age assemblages are widely scattered within the post-Early Neolithic cluster, suggesting the absence of any significant change in core reduction approaches. While changes do appear to have occurred in the complement of retouched types, these do not seem to have had an overtly technological basis, so much as a stylistic one. A type-list of the kind long in use on the Continent would thus be a great asset in understanding the various stone industries.

Tools

Some archaeologists have calculated the breadth : length ratio scores for tool groups as well as for flakes. These data have been joined with the flake assemblages, and the results of principal axis analyses appear in Figs. 5 and 6. For the purpose of this study, the sites have been split into two groups, at the division between the Early and Late Neolithic as traditionally defined. In practice, this means that the conventionally Early assemblages from Alfriston and Offham are mapped in Fig. 5, rather than in Fig. 6, as would have occurred if their classification as Late Neolithic, suggested above, had been

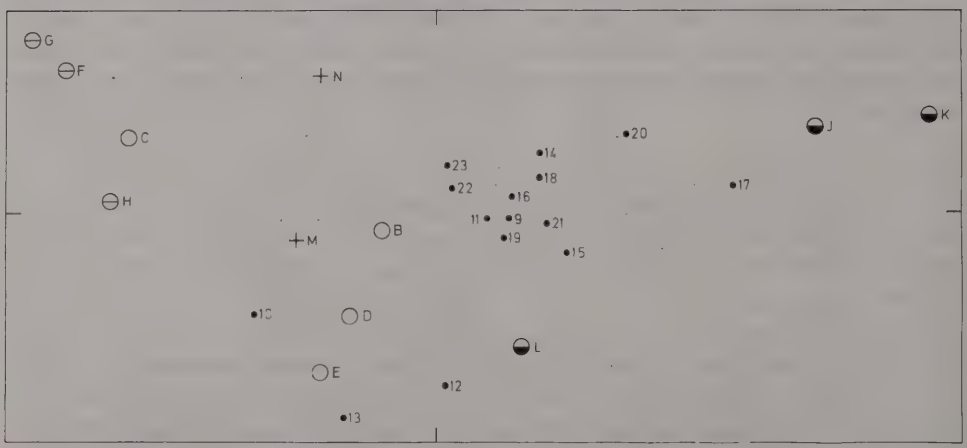

Fig. 5 Early Neolithic assemblages plotted on first two principal co-ordinates (90%: 74, 15). • unused flakes, ○ used flakes, 'class A', ⊖ serrated flakes, ◒ scrapers, + other tools.

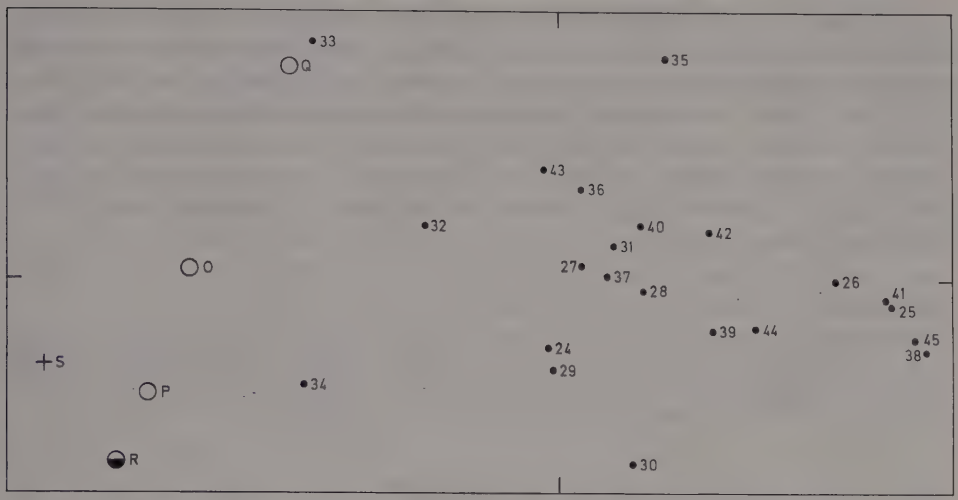

Fig. 6 Late Neolithic to Bronze Age assemblages plotted on first two principal co-ordinates (87%: 74, 13). • unused flakes, ○ used flakes, ◒ scrapers, + all tools.

Table 3 End-scrapers

Site	End-scrapers % Ai	End-scrapers Total A	Stage	Source
Wawcott III	32	66	Early Mesolithic	Froom, 1976: Fig. 76
Broome Heath (old land surface)	26	155	Early Neolithic	Wainwright, 1972
Broome Heath (pits)	30	53	Early Neolithic	Wainwright, 1972
Hurst Fen	31	502	Early Neolithic	Clark *et al.*, 1960
Windmill Hill	15	173	Early Neolithic	Smith, 1965
Arreton Down	41	99	Late Neolithic	Alexander *et al.*, 1960
West Kennet	16	400	Late Neolithic	Smith, 1965
Durrington Walls	20	133	Chalcolithic	Wainwright and Longworth, 1971
Mount Pleasant (enclosure ditch)	16	106	Chalcolithic	Wainwright, forthcoming
Mount Pleasant (palisade)	10	68	Chalcolithic	Wainwright, forthcoming

'Long' scrapers (type Ai: length 1.5 × breadth) as percentage of end-scrapers (type A). Types defined by J. G. D. Clark. Stages as described in text.

followed. Fig. 6 was prepared before the publication of the Bronze Age assemblage from Risby, which is thus absent from this diagram.

Beside the Early Neolithic flake assemblages (Fig. 5), the scraper groups are relatively broad. This is particularly apparent when the relative locations of the scrapers and flakes from Hembury (J and 9, respectively) and from Carn Brea (K and 11) are compared. This is, indeed, what one would expect of tools that were probably gradually shortened by resharpening at one end. On the other hand, tools in which the flake edge was primarily of importance, are to be found at the opposite extreme.

Similarly, the three assemblages of used flakes from the Late Neolithic and Chalcolithic (Fig. 6) are at the narrower end of the spectrum. Unlike the Early Neolithic examples, however, in this case the one scraper assemblage (from Arreton Down) is also at this end. Table 3 presents all of the available information on large scraper assemblages analysed according to Clark's classification (Clark *et al.*, 1960), which includes a division based on a breadth : length ratio (at all sites, end-scrapers comprise the great majority of these tools). It is apparent that the Arreton Down scrapers are longer than those from any other site, whatever its date.

Conclusions

Some of the points made above are conveniently summarised in a table presenting the average percentage scores for each stage defined. The general point to note is that the trend towards broader flakes appears to end with the Chalcolithic.

Stage	No. of assemblages	Breadth : length classes					
		<0.2	0.2–0.4	0.4–0.6	0.6–0.8	0.8–1.0	⩾1.0
Early Mesolithic	4	2	43	27	13	6.5	9
Later Mesolithic	3	0.5	15.5	30.5	22	14.5	17
Early Neolithic	12	0	11	33	27.5	14.5	13
Late Neolithic	7	0	4	21.5	29	20	25.5
Chalcolithic	12	0	2.5	15	24	24	35
Bronze Age	5	0	3.5	14.5	23	23	35.5

A feature that seems to be associated with the fall in the care given to core preparation, is an increase in retouched types with a high proportion of surface area shaped by invasive flaking or grinding. Perhaps the best known of these in the final stages are barbed and tanged projectile points and the small 'thumb' scrapers, both with Beaker associations, and the range of 'knives' and 'fabricators'. The emphasis on the careful production of blanks for conversion to tools in the Mesolithic (supreme examples of such products being microliths and trachet celts) is reduced in the Early Neolithic, remaining only in the manufacture of blades. By the Late Neolithic, this emphasis has shifted almost entirely to the selection of flakes from more or less randomly produced debitage, which are then subjected to intensive shaping. When flaking skills return to serve specialised needs (such as shale turning tools in the Iron Age and Roman periods, or more recently still, gun-flints) attention is once again directed to the production of intermediary blanks. Without overstressing a controlled blank production/selection from waste dichotomy, it seems that a model along these lines can provide a useful framework for the eventual overhaul of post-glacial lithic typologies that is becoming increasingly desirable.

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Abstract

This paper reviews the published and unpublished data relating to the breadth and length measurements (expressed in ratio form) on tools and on unretouched flint flakes in post-glacial assemblages from southern England. A model for technological change for the period is proposed that takes account of the results of multivariate analyses of these data. One general result of the study is to show that waste assemblages from the area considered exhibit structural patterning analogous to that of the retouched implements and weapons.

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The Phallus in the Art of Roman Britain

by PERCIVAL TURNBULL

Introduction

The extent to which scenes and motives of an erotic or of an overtly sexual nature were freely displayed is a noticeable feature of much of Roman art. The ubiquity of the phallic emblem, in particular, is often surprising to the modern eye, and when these are seen together with the variety of erotic scenes which were popular, it becomes clear that many Romans were content to surround themselves with objects decorated in an unashamedly sexual style, and to do this, indeed, to an extent which can surprise even a society so proud of its liberal views as our own.

By far the most common sexual motive found in Roman art is the phallus, a device found in many contexts, and apparently with a varying significance. The potency of the phallic emblem was not, of course, one in which only the Romans placed credence: it has been found at different times in many societies all over the world, and the Romans inherited a native Italian phallic tradition, as well as having access to those of, among others, the Greeks and Celts. The primary significance of the phallus, as a symbol of fertility, is fairly obvious, and others powers were related to that of fecundity: 'an emblem of fertilising power, the phallus was the foe of sterility, of death, and of all the ills that flesh is heir to' (Hastings, 1917). So developed the power of the phallus as an apotropaic charm, and the main reason for its use in Roman art seems to have been as a protection against the Evil Eye. Varro tells us that phallic amulets were used to protect children against evil (Varro, *De Lingua Latina*). In the Borgia collection is an amulet showing the Eye being assailed by a number of animals and birds accompanied by a winged phallus, a theme also seen in a number of mosaics and carvings from North Africa. The common tendency to place phallic carvings at street corners and on the walls of buildings was surely aimed at discouraging malevolent influences from the vicinity.

Phallic representations are particularly common in military contexts, and this apotropaic power, combined with a suggestion of supremacy and domination (Vangguard, 1969), seems the most likely motive in such cases: it is unlikely to have been the fertilising power of the phallus which caused it to be led before the chariot of a triumphant general.

Stone-carved phalli are common, and include a number of *ex-voto* tablets. An irregular slab of about 2 ft square, from Adel in Yorkshire, has a phallus with a rather

crudely pecked inscription around it, reading *PRIMI/NUS/MINTLA*. (Collingwood and Wright, 1965). It has been suggested (Payne-Knight, 1866) that the second word should be in the dative case, making *Priminus Mentulae* a dedication by Priminus to the personified phallus (suggesting, incidentally, that the cult reached Britain in its Italian form). Collingwood and Wright (Collingwood and Wright, 1965) have interpreted the inscription as 'Priminus, his phallic charm', but have failed to justify this on grounds of syntax. A stone from the Antonine fort of Westerwood in Scotland (Collingwood and Wright, 1965) is in the form of a plaque, with carved phallus, and the words *EX VOTO*. A secondary inscription on the back of the stone has been rendered by Collingwood and Wright *NUX* (nut?), and by Payne-Knight as *XAN*, suggesting that the donor had dedicated the stone after 10 years of disease. The phallus on a stone from Maryport points towards an elliptical object: this may represent the female member, but it is perhaps more likely to be the Evil Eye attacked by the phallus: if this is so, then the stone is not a dedication to the phallus but a charm to protect its donor, M. Septimus, from evil.

It is particularly common to find the phallus carved upon building stones: there are innumerable examples from all over the Empire; a fine example is set into the wall of a cottage next to the Newport Arch in Lincoln. Other notable British examples are from Birdoswald, or at the *principia* or the bridge abutment at Chester. Three facing stones from the fortress wall at York have phalli carved in relief (Wellbeloved, 1842). Two very stylised examples from the *vicus* at Vindolanda have been illustrated by Birley (Birley, 1973). On sites such as Pompeii, Leptis Magna and Timgad such stones may still be seen on walls, usually high above street level. These phallic building-stones, and the phalli carved upon the working faces of quarries (Birley, 1973) were probably intended to ensure good fortune for the edifice in question, but there are certainly some true *ex-voto* dedications, showing the phallus venerated as a divine personification rather than used as a protective charm: the Adel and Maryport stones show such a worship of the phallus, and there is a considerable difference between the phallus as a god and the phallus as a charm.

There is a wealth of phallic art on Roman fine and coarse pottery, the discoi of lamps, small bronze objects, jewellery, etc. The best known of the erotic pottery includes certain of the figure types found upon both Italian and Gaulish *terra sigillata*. A wide range of these is illustrated in the final pages of Oswald's *Index of Figure Types*. Déchelette, however, failed to illustrate any of the erotic scenes which he described, and in his descriptions he lapsed from his native French into somewhat periphrastic Latin: a scene on one vessel, for example, he described as '*vir nudus supinatus potat; super eum mulier amore iuncta*'. These often beautifully fluid and well-executed scenes, however, are not in the strictest sense phallic, and it is appropriately enough to coarse pottery that we must turn for a number of interesting and frequently enigmatic phallic scenes.

Two particularly interesting coarse pottery vessels from Britain bear scenes of striking similarity. The first is a Trajanic or Hadrianic 'pie dish' form, from London, with a scene lightly incised upon it. On the left, appearing from the broken edge of the sherd, is a large, goose-like bird; facing it on the right is a man. Dressed in a knee-length tunic, he

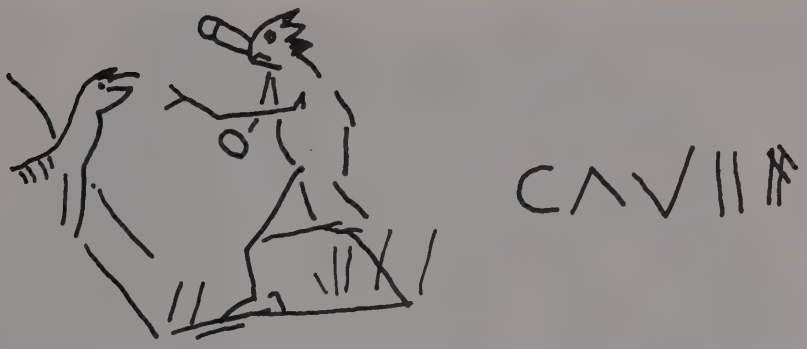

Fig. 1 Coarse pottery vessel from London.

extends one hand towards the bird, holding in the other an object which may be an egg. His most outstanding characteristic, however, is his nose, which is unmistakably phallic in form. An inscription at the far right reads *CAVI/M.*, reconstructed by Wright (Wright, 1971) as *CAVI MALUM*. Wright is, however, surely mistaken in being able to see a pig between the man and the bird. (Fig. 1).

The companion to this sherd comes from Caerleon (Wheeler, 1928), and is from a local copy of the form 'Ritterling 8', stratified with pottery of *c.* AD130–160. The graffito decoration shows much the same scene as the sherd from London: the bird has now developed a long bill like that of a stork or heron; the man, whose ornate conical hairstyle replaces the dishevelled coiffure of the man from London, holds a vessel, perhaps a basket, high in his right hand. It is clear that these two scenes portray some legend sufficiently current at the time to require no further explanation, and which does not appear to have survived in any other form. There are stories of pygmies fighting cranes, and pygmies are often represented as ithyphallic: the phallus is, however, usually placed more conventionally.

Two sherds of a vessel from South Shields, Tyne and Wear, have fragments of a phallic scene, rendered 'en barbotine'. One piece (Plate I) carries the lower half of a nude male figure, facing to the right, with a heavily exaggerated phallus. From the broken edge of the sherd appears a slender hand, probably female, which lightly supports the phallus. The companion sherd (Plate II) shows most of a naked female, waving aloft in one hand a huge phallus. Two further enormous phalli are converging on her clearly marked genitals. Here we have, unmistakably, a celebration of the fertilising power of the phallus: it is presumably part of a scene like that on a pot from Horsey Toll, now in Peterborough Museum, which shows the male figure squirting a stream of semen on to the ground whilst the woman beckons reprovingly – an exhortation not to waste the seed? Neither example comes from a liturgical context, and there is no reason why they should not have been in everyday household use.

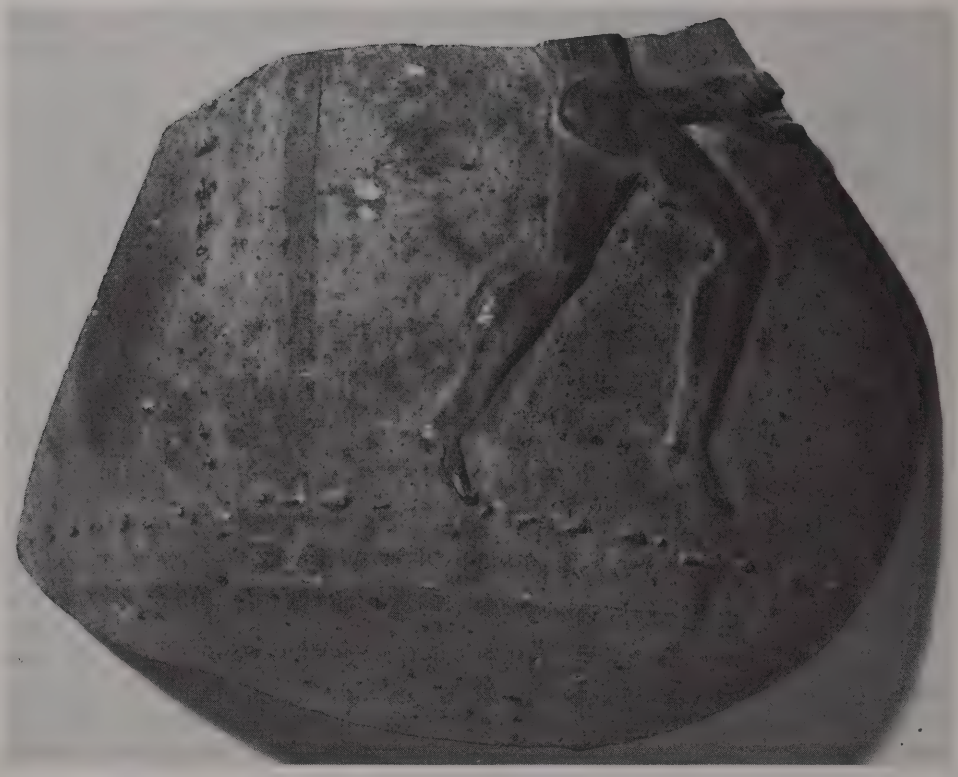

Plate I Sherd from South Shields, Tyne and Wear, in Museum of Antiquities, Newcastle upon Tyne. Accession no. 1923.50.

Phallic emblems are also shown on a number of pottery vessels from Colchester. A locally made beaker with barbotine decoration has large horizontal phalli, and on another sherd the emblem has been endowed with wings and bird-like feet: the tip of the glans is drawn out in a manner suggestive of a beak (Hull, 1963). Terra-cotta lamps are often decorated with phallic designs usually upon the *discus*: a nice example from London was illustrated by Payne-Knight, and a lamp from Verulamium is in phallic form, with the hole for the wick in the glans.

Particularly noticeable among phallic objects from Roman Britain is a large group of bronze amulets or harness-fittings, which have come particularly from military sites of the 1st and 2nd centuries, and to which attention was first drawn by Dr Graham Webster (Webster, 1967). The finest examples belong to a type consisting of two upcurving elements with a suspensory ring between. One of the elements ends in a phallus, often beautifully moulded, and the other in a wrist with clenched fist, the thumb of which protrudes between the fingers in the gesture known as the *fica*, probably imitative of the

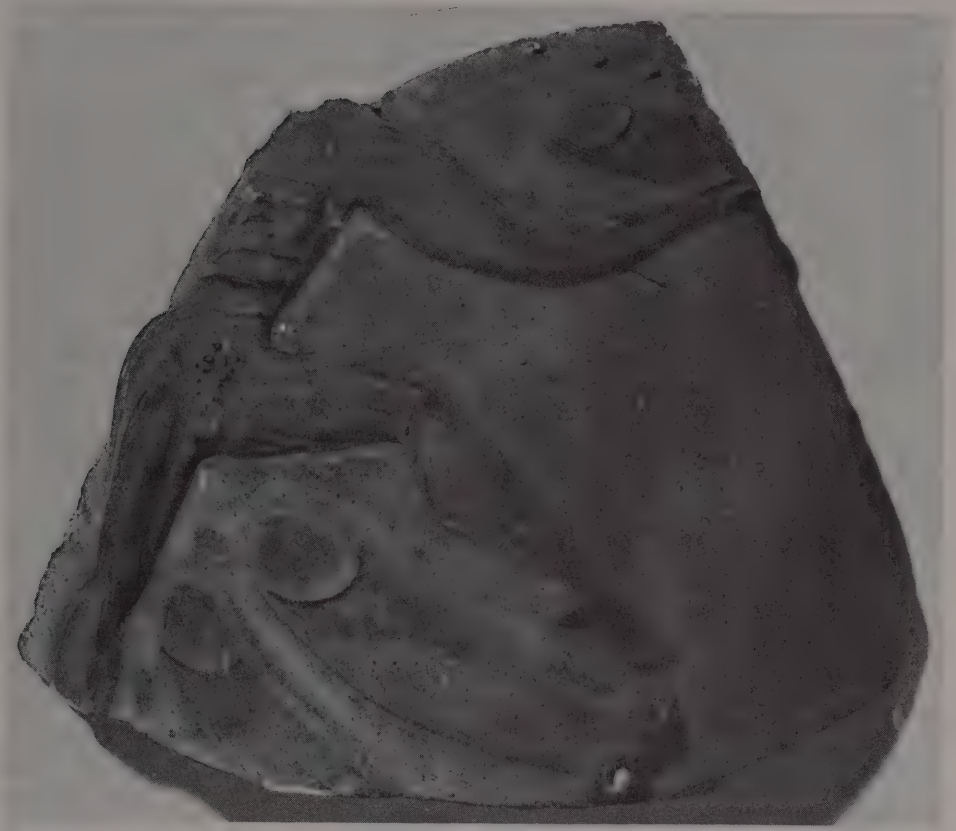

Plate II Sherd from South Shields, Tyne and Wear, in Museum of Antiquities, Newcastle upon Tyne. Accession no. 1923.50.

phallus, and credited with apotropaic powers. A small flaccid phallus hangs from the middle. There are several examples from Britain, and they are well paralleled on the Continent, with notable examples from Pompeii and Mainz. A simpler form, pierced for suspension, was produced in bone. The phallus and the fica on these amulets have appeared in some interesting juxtapositions. An example from Mainz (Behrens, 1917) is surmounted by a human head, modelled in an unmistakably Celtic style. The links between the totems of the head and the phallus in Celtic iconography are well-attested, and have been discussed at length by Anne Ross (Ross, 1967). Several of these amulets from Gaul include a bull's bead, another powerful symbol (of fertility, or of aggression?) in the Celtic world (Roes, 1956). The same influences may be at work on a number of 'medallions' carved from discs of antler and decorated with phalli (one example is in the London Museum). One such disc from Mainz (Behrens, 1917) is unadorned, which rather

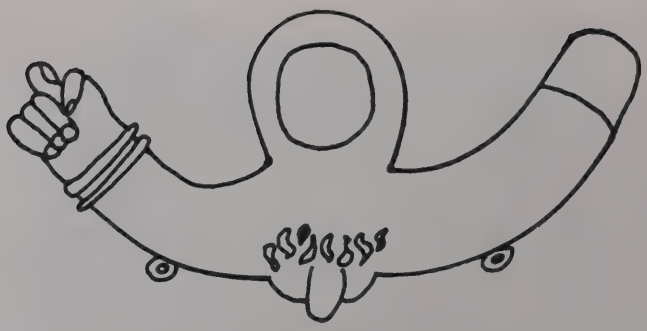

Fig. 2 Bronze phallic amulet with *fica.*

suggests that the actual material used may have had a certain totemistic significance, as well as the device upon it.

In addition to these interesting pieces are a very large number of simpler pendants, consisting simply of a phallus, often curved, and furnished with a loop for suspension; these are abundant both in Britain and on the Continent.

Many of these bronze phallic pendants come from early Roman military contexts, and it seems most likely that they are, indeed, harness-trappings intended either to protect their owner from mischance or to emphasise his aggressive, martial nature. One is reminded also, and particularly in the case of the simpler amulets, of Pliny's words regarding these *fascini, Infantum etiam remediis ex cervice suspenduntur.* (Pliny, *De Scarabeis*). Petronius, too, was familiar with the looped-phallus class of pendant: of one character in *Satyricon* he tells us *Hebebat enim inguinem pondus tam grave, ut ipsem hominum laciniam fascini crederes* (Petronius, *Satyricon*).

Two interesting bronzes found in Britain, each consisting of three phalli combined into a single figure, were published in 1866 (Payne-Knight, 1866). The finer of the two was discovered in York in 1844. It is a beast, the body and head of which are formed of a phallus; it has hind legs like those of a dog or lion, and it has the feathered wings of a bird. The tail is a phallus, and another projects from between the legs. The other example, from London, is furnished with a number of small cast-on loops. It is clear from parallels at Pompeii (Grant, 1975) that these are tintinabula: the loops of the piece from London were for suspending little bells, the whole assemblage being hung from a beam or lintel. Grant sees these as possibly part of the apparatus of Oriental mystery cults. It is interesting to compare these bronzes with a figure set upon a wall at Leptis Magna (Squarciapino, 1966), showing a phallus with rear legs like those of a pig between which protrudes a phallus pointing towards an open eye: an apotropaic significance for the bronzes seems possible; they were perhaps household protections against the Evil Eye.

The addition of animal, or particularly bird-like, attributes to the phallus was a very common practice. A barbotine sherd from Colchester with a bird-phallus has been men-

tioned, and other examples of winged phalli are numerous. A pot from Saffron Walden shows a *quadriga* drawn by winged phalli: a bronze winged phallus was found at Totterhhoe, Bedfordshire (Smith, 1906): a stone from Wroxeter shows a winged phallus pulling a cart: the testes of a phallus carved on a stone at Housesteads are cleverly extended to suggest wings. The role of the winged phallus seems to be to attack the malevolent Eye: the addition of animals' legs, wings or tails seems to be a kind of 'demonisation'; the phallus becoming a being in its own right, and its potency being greatly enhanced.

What, then, is to be made of the considerable variety of phallic art from Roman Britain? There was certainly a native British phallic cult, linking the generative and sexual power of the phallus with the equally potent symbol of the severed human head, but with the arrival of Romans the phallus acquired new meanings. As Fascinus, Mentulus or Priapus, the personified Phallus, it does seem to have been venerated in its own right, as a divinity associated with human fertility, the fecundity of crops and beasts, and with boundaries. A trace of the ritual associated with such a cult is recorded from Urswick in Cumbria, where a 'Priapus Stone' close to a Romano-British settlement was 'formerly dressed on Midsummer Day by Rustics'. The persistence of the cult is underlined by the existence of a medieval encyclical prescribing penalties for those who *praecantauerit ad fascinum.* The generative phallus is essentially of importance in a rural, peasant society; it ensures the fecundity of family, cattle and crops alike, and loses much of its importance in an urban community or in the society of soldiers. Most examples of phallic representations are concerned with the power of the organ as a protection against bad luck and malicious magic.

In considering Roman phallic art, particularly in the context of Roman sexual and erotic art as a whole, it is quite clear that all classes of society lived with this art all around them, without thinking it undesirable or shameful. Even children wore phallic charms; a beautiful gold ring from London (Henig, 1974), decorated with a *fascinus* on the bezel, is so small that it could surely have been worn only by a child. Public nudity was acceptable in some situations in Roman society, and throughout much of antiquity whole families of some social orders lived in a single room. Factors such as these combined to make people much less sensitive to sexual and anatomical matters than latterly. We may be sure that Roman motives and responses towards phallic and erotic art were much more complex than our own.

Acknowledgements

I should like to thank the Museum of Antiquities of the University of Newcastle and the Society of Antiquaries of Newcastle upon Tyne for permission to publish Plates I and II, and Peterborough Museum for being able to discuss the Horsey Toll pot, shortly to be published: Mr Hugh Chapman for drawing my attention to Figs. 1 and 2, and Dr Martin Henig for his help and patience. Susan Seright typed the manuscript.

Abstract

The use of the phallic emblem is notably common in many classes of Roman art in all of the provinces, not least in that of Britain, where it may be found represented on pottery, jewellery and masonry, as well as on a wide range of domestic objects. The motives for this wide portrayal of the emblem are discussed, and several groups of objects considered in more detail. More than one type of phallic cult may be distinguished, including the veneration of the personified Phallus, the respect of the phallus as a token of fertility, and its use, perhaps more common, as a powerful apotropaic charm.

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A comparative survey of Bone Assemblages from Roman sites in Britain

by ANTHONY KING

Introduction

Most recent excavation reports are accompanied by an analysis of the animal bones. All too often, however, these analyses are separated from the main text and have no references to other work apart from those on the methods of osteology. This tendency has diminished the usefulness of the large amount of work put into such analyses because the reader is not presented with the information with which to assess regional bone assemblages. This paper has been written to provide that background information for the Roman period in Britain by summarising as many published bone reports (including theses) as were available to the writer in mid-1977 (Table 4) and by providing a short discussion on the main trends visible in the accumulated evidence.

The selection of useful reports

The differences in the standard and amount of information provided by bone reports are very great. Recent ones are the most detailed, consistent with the more sophisticated approaches to archaeology of the last two decades. The best discuss all the topics given in Table 1, and most contain at least sections 1 or 2 of that table. Quantified data, however, are rare in pre-war work (*pace* Pitt-Rivers, 1892; Meek and Gray, 1911, Dell, 1932), and reports without this information are usually only useful for comparative purposes if they give the relative proportions of the species. Those reports (including several recent ones) that list the species present without their relative proportions are frustratingly useless, for they show that the excavators, having troubled to have the bones examined, have, in the end, presented what is usually obvious: that the common domesticates were present on the site. Even worse are reports which indicate that quantified analysis took place, without giving the results in the text. References to such non-quantified reports are given in King (1975, Table 16).

Naturally, those reports which calculate the relative proportions of the animals or give the basis from which proportions can be derived are the most useful. This study is confined, for the most part, to these quantified assemblages, with the most weight being given to 'high-yield' sites where there are numbers of fragments in the hundreds or minimum numbers of individual animals over 20.

Table 1 The structure of a bone report

1. Numbers of bones present for each species.
2. 'Minimum numbers' of animals for the main domesticates and food animals.
3. Numbers of each particular bone for the main domesticates or all the species present.
4. Ages at death of the main domesticates, evidence of sex, etc.
5. Butchery marks present.
6. Pathology.
7. Measurements, or a summary, usually taken from a standard manual.
8. Discussion of the *archaeological* significance of the assemblage, including spatial or chronological trends and patterns.
9. Reports, usually separate, on specialised bone groups, i.e. small mammals, birds, fish.

Problems in inter-site comparison

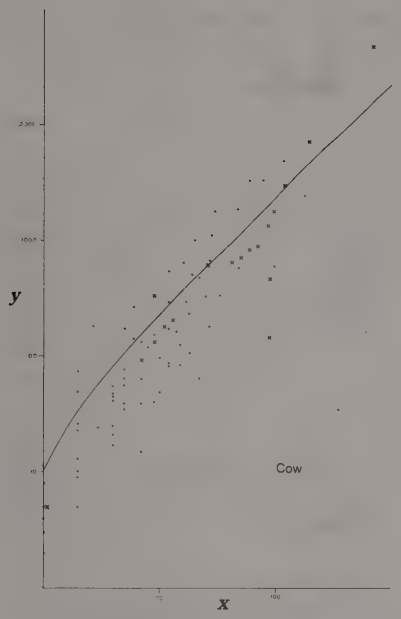
Two main methods are used for summarising the identifications of each bone, either the number of fragments of each species (abbreviated to BN – bone numbers), or the minimum number of animals killed in order to account for each bone (abbreviated MN). The merits of each method have been discussed at length elsewhere (see Casteel, 1977, for references, also Ducos, 1968, 1973, 1975). The arguments in favour of each are not of concern here except in so far as the question of comparability is concerned. Whether or not the methods each represent a different plane of study and interpretation (Chaplin, 1971: 63–70), they can be directly compared if there is a relationship between them.

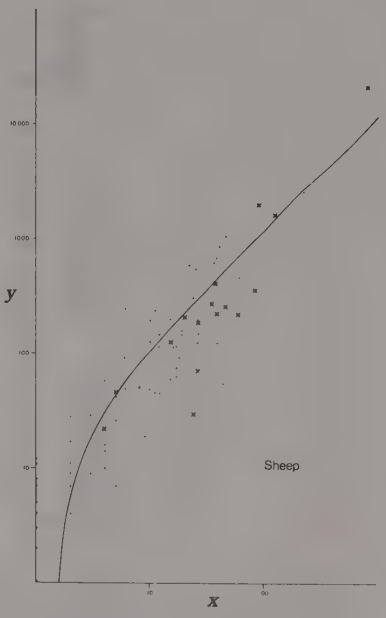
That there is such a relationship has been demonstrated by Ducos (1968) for a collection of Palestinian bones, and the method is loosely followed here (Fig. 1). A plot of BN against MN on a logarithmic scale shows a quasi-linear characteristic and the regression line obeys the equation:

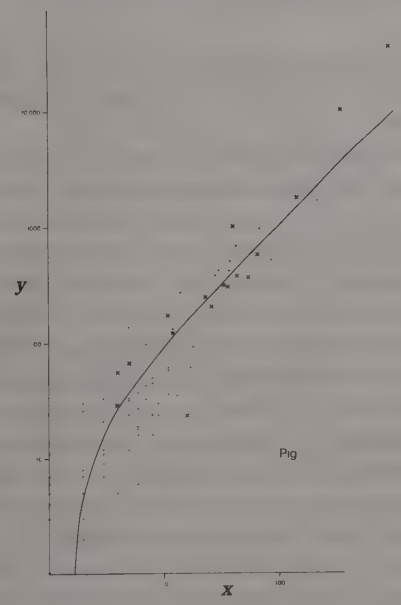
$$y = nx - a$$

where y = BN, x = MN, a is the intercept of the y-axis when $x = 0$ and n is the value of the slope of the line. The equations are given in Fig. 1 together with the correlation coefficients for the British sites only. It is sufficient to demonstrate the relationship, for the equations themselves are unimportant and it would be foolhardy to use them for the prediction of BN from MN or *vice versa*.

Included in Fig. 1 are some prehistoric data from Europe, given in Higham (1968), which conform closely to the Romano-British pattern and indicate that the relationship is not a regional or cultural characteristic but is valid for some other reason (Ducos' data for Palestine (1968: 6–8) are also very similar). A clue to the nature of the relationship lies in the fact that, in general, the number of bones per animal increases with sample size. This means that a greater proportion of each animal is found on sites which have had a greater proportion excavated, or to be more exact, a greater proportion uncovered of the animals killed and consumed on the site. This can be confirmed by the observation that most small sites yielding up to 500 bones have average bones per cow at 20 or below, but Roman Portchester (108 on Table 4) has *c.* 40 and Manching (figures in Higham, 1968)







British sites are black dots.
Prehistoric sites are crosses.

Regression lines (British data only)

Cow	Line illustrated	$y = 24.80x - 15.24$
	Other line	$x = 0.0249y + 7.15$
	Corr. coeff.	$r = 0.79$
Sheep	Line illustrated	$y = 12.55x - 19.01$
	Other line	$x = 0.0469y + 5.96$
	Corr. coeff.	$r = 0.77$
Pig	Line illustrated	$y = 10.90x - 17.20$
	Other line	$x = 0.0739y + 3.21$
	Corr. coeff.	$r = 0.90$

The y-axis is BN (bone numbers)
The x-axis is MN (minimum numbers of animals)

Fig. 1 Bone numbers and minimum numbers of individuals compared for cow, sheep and pig.

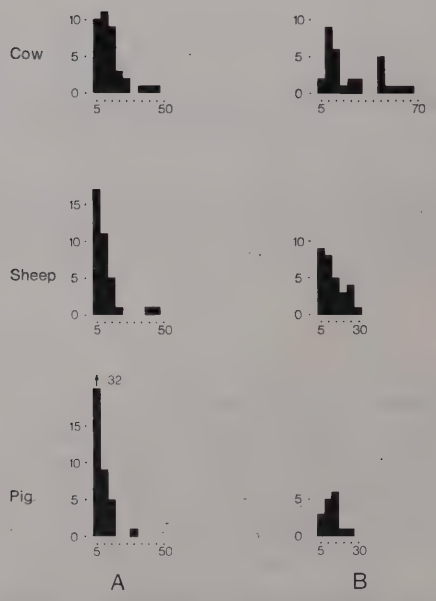


Fig. 2 Bones per animal for cow, sheep and pig. Column A is where 'minimum animals' are less than 10. Column B is where 'minimum animals' are 10 or more. The *y*-axis is the number of cases in each group. The *x*-axis is the number of bones per animal in units of 5.

has *c.* 70. Fig. 2 demonstrates this in the form of histograms and shows that for 'low-yield' sites the number of bones per animal is too low to allow meaningful use to be made of the data.

MN and BN, therefore, have a rough relationship and can be compared in a general way, bearing in mind that MN increases at a slower rate than BN with the size of sample and that small assemblages are of limited use.

Another problem of inter-site comparison is that of differential survival of the bones of different species. It can readily be seen on Fig. 2 that pig has, on average, fewer bones per animal, and this hint of poor representation of pig bones is confirmed in Table 2 where the percentage of mandibular to limb bones (other than feet) is given. The mandible is chosen as the standard because it is the most durable and usually the most common bone for each species. This is perhaps due to its greater density (Binford and Bertram, 1977: 109). Whether soil processes or butchery practices are responsible for this phenomenon is not known, for data on soil conditions at the sites studied are not available. Soil acidity is worthy of serious consideration as the agent responsible, for it appears from observation of cut marks that sheep and pig were treated very similarly by the butcher.

These two problems show up some of the factors to be considered when comparing site assemblages and they serve as a deterrent to making close interpretations of the differences between sites.

Table 2 Mandibular and limb bones (excluding fibulae, metapodials and phalanges) in cow, sheep and pig

	Cow			Sheep			Pig		
Site	a	b	c	a	b	c	a	b	c
Chesterholme (1)	331	1,013	32.7	112	239	46.9	129	236	54.7
Grimthorpe (14)	37	145	25.5	34	59	57.6	8	31	25.8
Margidunum (24)	60	99	60.6	48	78	61.5	17	18	94.4
Lincoln (25)	8	22	36.4	30	42	71.4	15	9	116.7
Longthorpe (34)	56	230	24.3	28	232	12.1	24	125	19.2
Overstone (39)	45	144	31.2	18	125	14.4	12	12	100.0
Sutton Walls (52)	91	380	23.9	162	258	62.8	136	126	107.9
Beckford (54)	13	35	37.1	23	25	92.0	12	7	171.4
Cirencester (56)	18	142	12.7	25	68	36.8	24	77	31.2
Shakenoak (58)	76	322	23.6	38	95	40.0	30	19	157.9
Whitehall (82)	43	173	24.9	47	198	23.7	11	92	12.0
Mermaid (84)	10	40	25.0	5	26	19.2	12	19	63.2
Hod Hill (99)	6	18	33.3	19	84	22.6	7	15	46.7
Twyford (105)	24	35	68.6	22	35	62.9	13	10	130.0
Portchester – Roman (108)	457	2,813	16.2	392	783	50.1	554	731	75.8
Portchester – Saxon (108)	453	1,524	29.7	624	795	78.5	705	450	156.7
Neatham (109)	93	310	30.0	129	83	155.4	48	35	137.1
Fishbourne* (111)	23	242	9.5	89	263	33.8	104	259	40.2
Bishopstone (116)	19	72	26.4	15	66	22.7	13	2	(650.0)
Total	1,879	7,803	24.1	1,869	3,561	52.5	1,882	2,282	82.5

a = mandibular bones, b = limb bones, c = 'a' as a percentage of 'b'.
**N.B.* The scores for Fishbourne are estimates from a diagram in Grant (1971).

Changes and trends in the composition of bone assemblages

The relationships of the three main food animals, cow, sheep and pig by site type and by time period are shown in Figs. 3 and 4.

The most distinctly observable trend is the decrease in the number of sheep bones (and in the few cases where MN have been used, numbers of sheep) relative to the other two animals by late Roman times. The 30% value for sheep is a useful indicator of this change and the proportions of different categories over this value are summarised in Table 3. The table also brings out this change in cultural terms for it appears that the more Romanised deposits, namely in villas, roadside settlements, towns and forts, tend to be less in favour of sheep than the native sites, which continue the Iron Age pattern. It is interesting to note how the early military sites tend to fall into line with the native sites, demonstrating their reliance on the available local food.

The explanation of this trend must be in terms of one of three factors: the location of more late sites in areas conducive to cow and pig herding, an increase in the amount of arable land or an increase in the amount of woodland. Concrete evidence for any of these factors is lacking but the apparent expansion of population by the 4th century would favour the first two as the more realistic explanations in most cases, for a greater area of woodland is not compatible with the establishment of numbers of new sites. The map (Fig. 6) showing the distribution of bone assemblages with more than 30% sheep bones,

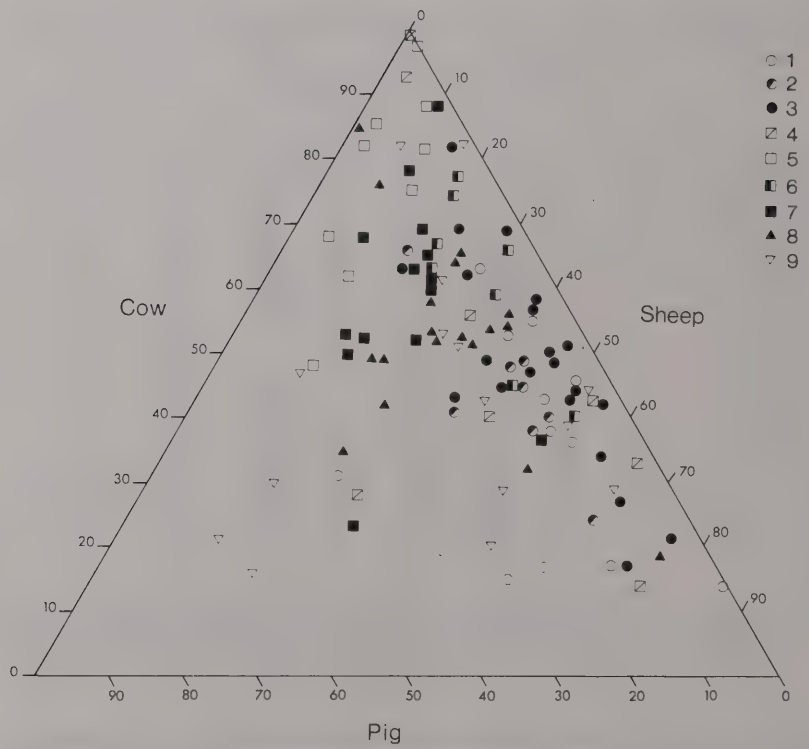


Fig. 3 Percentages of cow, sheep and pig bones by site category. Key: 1, Iron Age; 2, 1st century native settlement; 3, native settlement; 4, 1st century military; 5, military; 6, roadside settlement; 7, Roman town; 8, villa, 9, Anglo-Saxon.

when compared with the map showing the total distribution of sites used in the survey (Fig. 5), does indicate that the incidence of assemblages with 30% or more sheep bones is, for the most part, restricted to the lowland area and to dry, light soils (e.g. chalkland rendzinas or valleys with well-drained subsoils) (see Curtis *et al.* (1976) or Agricultural Advisory Council (1970) for soil maps) and, therefore, that the location of sites in areas such as the highlands or on river valley clays, which are more suited to raising cattle or pigs, took place mainly in the latter half of the Roman occupation and represents a general trend towards clearing woodland and occupying marginal areas. The increase in the relative proportions of cattle or pig numbers is compatible with this since both animals were originally woodland species and, unlike the sheep, are native to North-West Europe, and more adapted to existing in a non-grassland habitat. It is noteworthy that sites in highland regions often have high proportions of cattle bones, which would perhaps indicate a less open habitat in the vicinity of those sites than is the case now.

A number of assemblages demonstrate the trend of decreasing sheep numbers by virtue of coming from sites with long occupations. These sites are Old Winteringham (18),

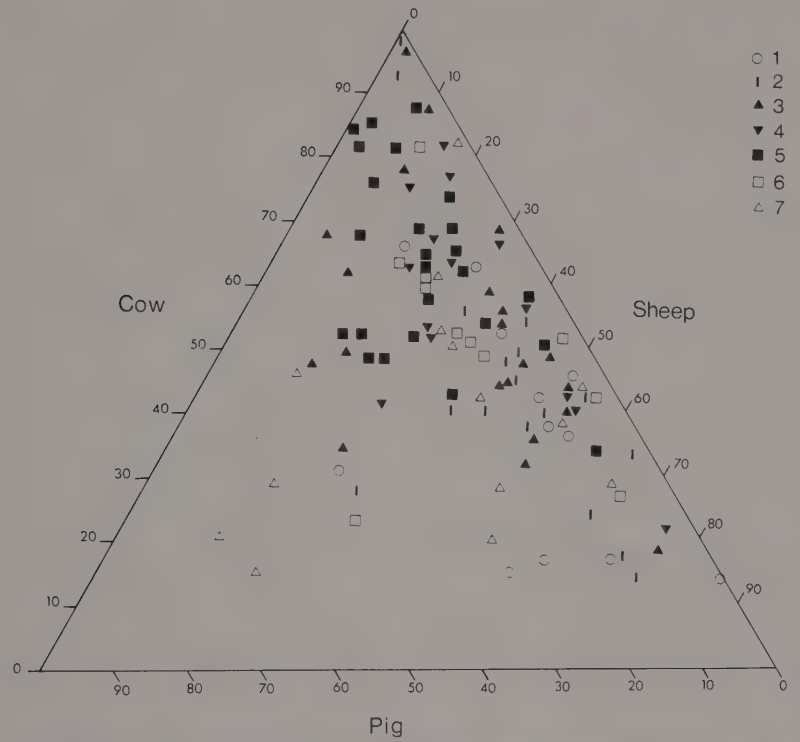


Fig. 4 Percentages of cow, sheep and pig bones divided chronologically. Key: 1, Iron Age; 2, 1st century; 3, 2nd century; 4, 3rd century; 5, 4th century; 6, 1st to 4th century; 7, Anglo-Saxon.

Table 3 Sites having 30% or more sheep bones

9 out of 11 (8/10)	Iron Age sites
8 out of 9 (9/10)	1st century native sites
16 out of 21 (8/10)	Other native sites
5 out of 8 (6/10)	1st century military sites
3 out of 8 (4/10)	Road-side settlements
7 out of 18 (4/10)	Villas
2 out of 14 (1/10)	Towns
0 out of 9 (0/10)	Other military sites
26 out of 38 (68%)	All early sites (1st and 2nd centuries)
10 out of 39 (26%)	All late sites (3rd and 4th centuries)

Winterton (19), Whitchurch (22), Margidunum (26), Hacheston (49), Latimer (64), Gadebridge (65), Ewell (80) and Neatham (109). A small group of sites in the West Kent area also collectively display this trend (West Wickham (88), Keston (89), Darenth (90), Eastwood (91) and Chalk (92)). In most cases the change is modest but two sites, Hacheston and Neatham, must have undergone major alterations in their economies in the

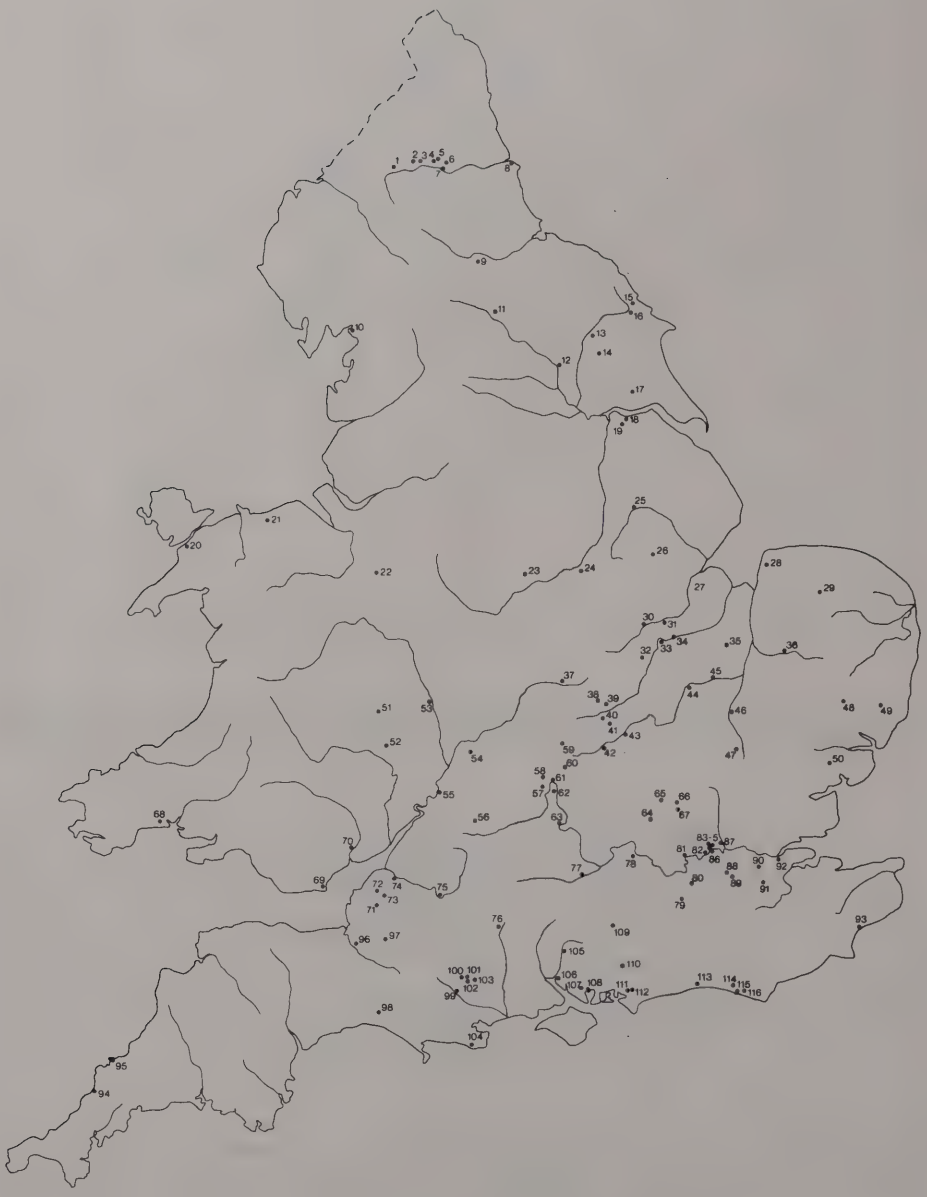


Fig. 5 The distribution of sites referred to in Table 4.

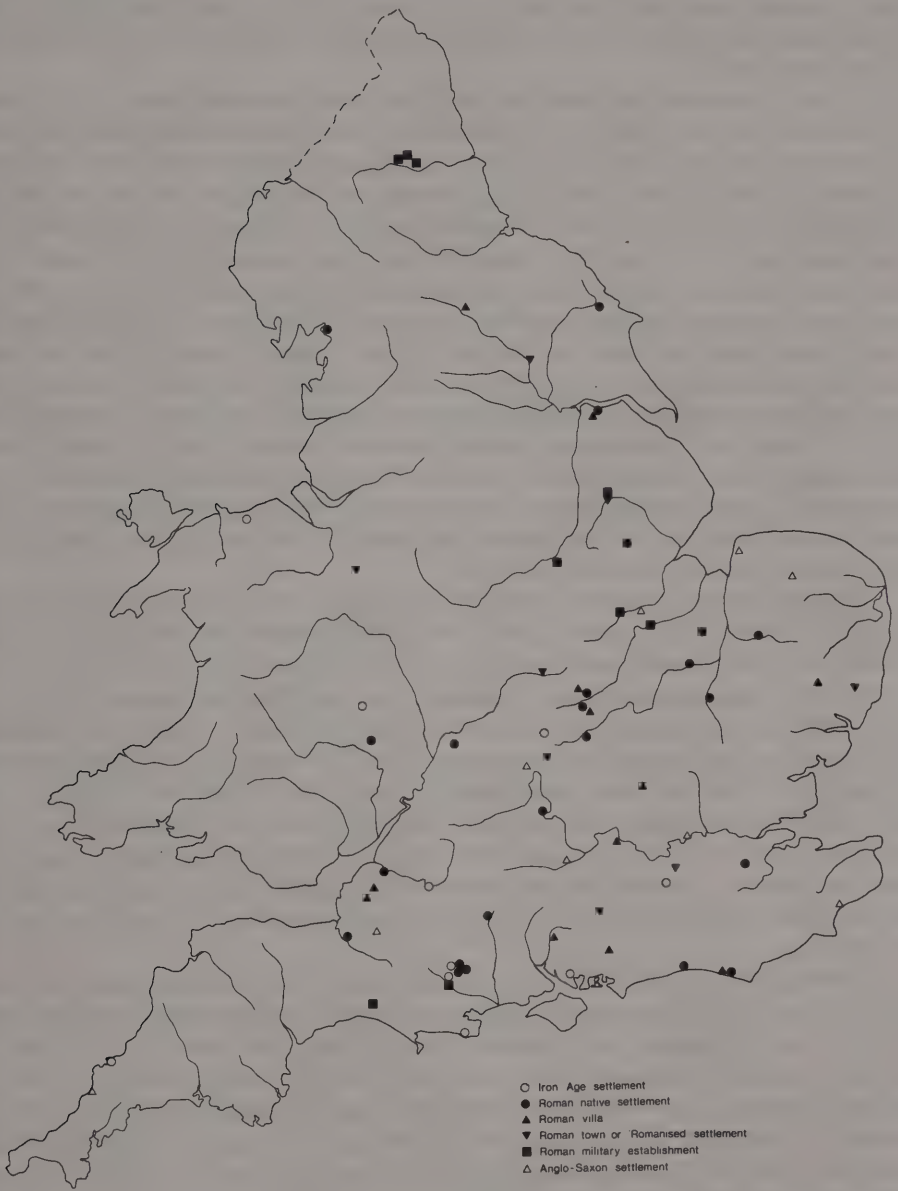


Fig. 6 The distribution of sites having assemblages with more than 30% sheep bones.

3rd and 4th centuries. The evidence from these sites obviously does not indicate occupation of marginal areas, as would seem to be the case with sites newly established in late Roman times. More likely is an increase in the exploitation of existing woodland and uncultivated areas.

Other indications that woodland areas were being exploited more in late Roman times come from the existence of cervid bones in more late assemblages than early ones. Of those reports which have information on the wild mammal bones, 39% concerning 1st century contexts have cervid bones, whereas the percentages for 2nd, 3rd and 4th century contexts are 53, 71 and 79%, respectively. The percentage of cervid bones is in most cases below 5% of total cow, sheep and pig bones, so that the level of exploitation must have been low, an observation in accordance with the lack of time available to farming communities for large-scale hunting activity. In the vast majority of cases the cervid bones found are those of red deer (*Cervus elaphus*), which is also the most common in assemblages with more than one species of deer. Roe (*Capreolus capreolus*) is fairly well represented, but in general the numbers are much lower than in the case of red deer. The fallow deer (*Dama dama*), said to have been introduced by the Romans, is very rare, being noted on less than half-a-dozen sites altogether, one of which is Iron Age (War Ditches, 46). These proportions may not so much reflect the relative numbers of each species as the probability that the size and meat weight of red deer, and the strength of its antlers, made it the first choice of the hunt.

Pig remains, too, contribute valuable evidence of changes in dietary preferences during the Roman period. There is the trend brought out above that cattle and/or pig bones tend to be proportionately more common on late sites (Fig. 4). The areas where high pig bone assemblages occur are in general in river valleys and on heavier soils (Fig. 7). The most distinctive trend, however, appears when Romanised deposits are compared with those showing more native characteristics (Fig. 3). Fifteen out of seventeen villa and 13 out of 14 Roman settlement assemblages have 10% or more pig bones, whereas 17 out of 30 'native' settlement deposits have less than 10% pig bones. The explanation of this is not easy to find. Obviously, a move to eating and keeping pigs implies an increase in woodland usage or perhaps the establishment of orchards, but political and cultural considerations must be taken into account for the interpretation of why these changes came about.

During the 3rd century problems of money supply led to the increasing imposition of taxes in kind. This may have led farming taxpayers to utilise more of the land available in order to maintain their standard of living. Also, there seems to have been an alteration in the *capitatio* or poll-tax in the 4th century to include livestock as well as humans (Stevens, 1966: 114). This would encourage the raising of beasts with large amounts of meat and other products such as hide in order to keep down the numbers. Cattle and swine fit this very well, for obvious reasons in the case of cattle, but for pigs probably because the edible carcase is 70% of original weight as opposed to the 50% of sheep. Woodland animals were also easier to conceal from the tax inspectors. A further reason for increasing pork consumption is that Mediterranean tastes regarded it as a deli-

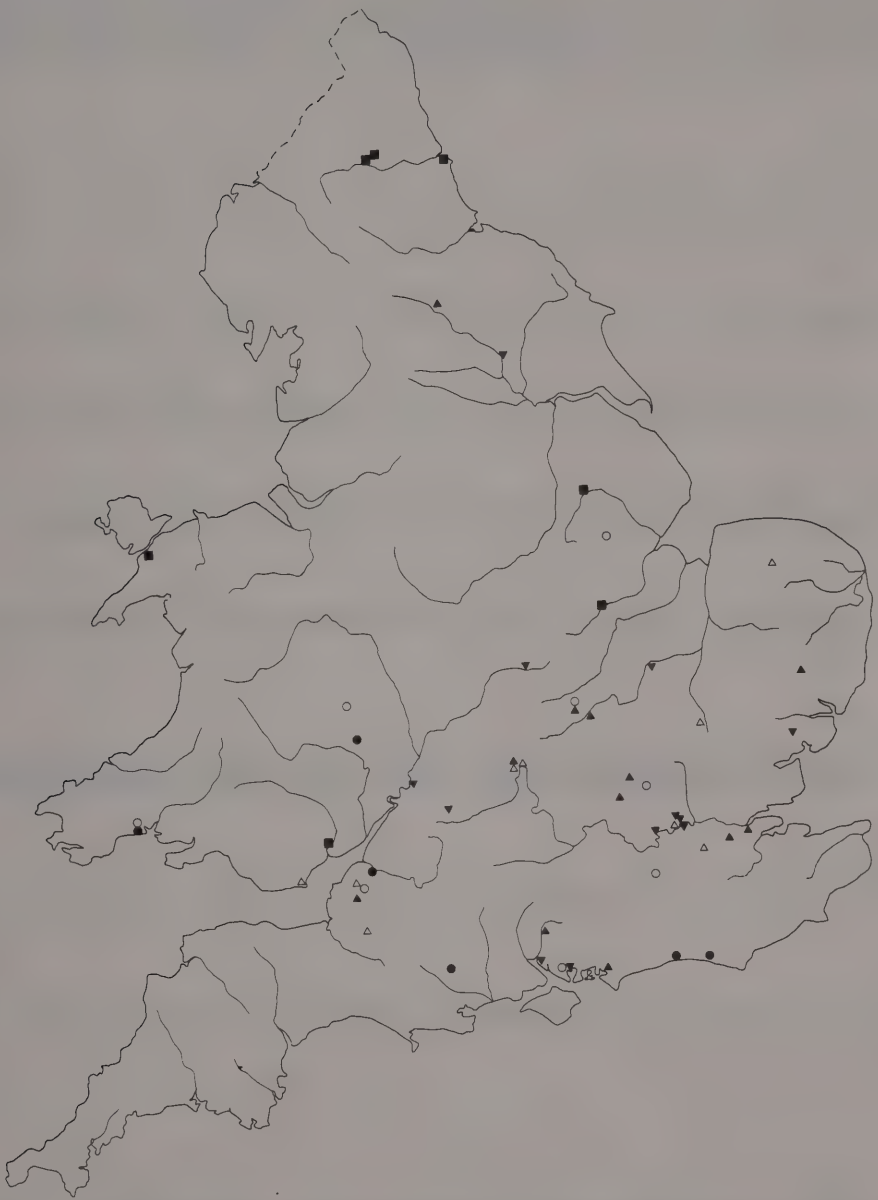


Fig. 7 The distribution of sites having assemblages with more than 15% pig bones. Key as Fig. 6.

Table 4 Quantified bone reports from Roman sites in Britain, with additional Iron Age and Saxon data

Site no.	Name	Type	Date	Method	Cow	Sheep/ goat	Pig	Horse	Other information	Sources
1	Chesterholme	M	2–4	BN	2,599	461	428	28	3, 4, 5, 6, 7	Hodgson, 1977
				MN	177	60	37	8		
		M	1–2	BN	26	1	1	–	4, 7	Hodgson, 1970
		M	4a	BN	299	28	11	2	4, 7	Hodgson, 1970
				MN	12	2	3	1		
		M	4c	BN	120	16	n.a.	2	3, 7	Cowley, 1970
				MN*	8	4	n.a.	1		
2	Turret 33b	M	2	BN	74	12	3	–	3, 7	Hodgson, 1972a
				MN	2	1	1	–		
3	Carrawburgh	M	2–4	BN	49	–	6	–	3, 7	Hodgson, 1972b
				MN	2	–	1	–		
		C	3	BN	3	17	32	–	3, 9	Fraser, 1951
4	Turret 26a	M	2b	MN	2	3	–	–	7	Chaplin, 1965
		M	2c	MN	4	7	3	–	7	Chaplin, 1965
5	Turret 25b	M	2b	MN	4	5	2	–	7	Chaplin, 1965
6	Turret 18b	M	2b	MN	2	5	1	–	7	Chaplin, 1965
		M	2c	MN	1	2	1	–	7	Chaplin, 1965
7	Corbridge	M	2–4	MN	195	26	20	11	3, 6, 7	Meek and Gray, 1911 Hodgson, 1968
8	South Shields	M	3	MN	14	5	8	1	7	Hodgson, 1971
9	Stanwick	N	1c	BN	46%	26%	13%	15%	–	Fraser, 1954
10	Haverbrack	N	2–4	MN	18	20	8	2	5, 9	Benson and Bland, 1963
11	Well	V	2–4	BN*	66	40	22	8	3	Jackson, 1951
12	York	T/M	2–4	BN	21	29	43	2	9	Rackham, 1976
				MN	4	3	7	2		
		C	2–4	BN	25	9	8	27	9	Fraser and Ryder, 1969
13	Langton	V	3–4	MN	6	8	2	2	9	Dell, 1932
14	Grimthorpe	I	EIA	BN	403	184	57	54	3, 4, 7	Jarman and Fagg, 1968
15	Crossgates	N	4	BN*	70%	20%	10%	–	–	Rutter and Duke, 1958
		A	5–6	BN*	60%	–	10%	30%		
16	Newham's Pit	N	1c–2a	BN	42	171	29	–	–	Fraser, 1958
17	Walkington Wold	N/C	4c	BN	33	8	2	5	3	Dawes, 1972
18	Old Winteringham	N	1	BN	724	600	194	64	–	Higgs and Greenwood, 1976
		N	3–4	BN	802	540	62	60		
19	Winterton	V	2	BN	748	471	116	40	–	Higgs and Greenwood, 1976
		V	3–4	BN	1,594	589	284	168		
20	Caernarvon	M	1c	BN	15	–	2	n.a.	4, 5, 7	Noddle, 1974
				MN	7	–	2	1		
		M	4a	BN	64	2	9	n.a.		Noddle, 1974
				MN	5	1	3	2		
		M	4c	BN	165	7	30	n.a.		Noddle, 1974
				MN	14	5	9	2		

21	Dinorben	I	EIA	MN	16	14	5	2	3	Gardner and Savory, 1964
		N	3–4	MN	41	16	8	4		
22	Whitchurch	R	1c	MN	–	4	–	–	3	Gittleson, 1968
		R	2a	MN	18	8	4	1		Gittleson, 1968
		R	2c	MN	28	15	4	6		Gittleson, 1968
		R	3a	MN	46	21	3	4		Gittleson, 1968
		R	3b	MN	38	8	–	5		Gittleson, 1968
		R	4a	MN	44	14	2	3	3	Gittleson, 1968
		R	4c	MN	4	4	–	–		Gittleson, 1968
23	Little Chester	M	2	BN	643	12	–	–	3, 4, 5, 9	Askew, 1961
				MN*	16	1	–	–		
24	*Margidunum*	M	1b	BN	65	126	6	2	3, 4	Harman, 1969
				MN	22	39	6	1		
		R	2–3	BN	109	60	16	18		Harman, 1969
				MN	18	15	8	5		
		R	3c–5a	BN	85	26	16	18		Harman, 1969
				MN	15	5	6	1		
25	Lincoln	M	1	BN	49	50	24	–	3, 4, 9	Harman, 1973a
				MN	10	8	8			
		M/T	1–2a	BN	5	9	3	–		Harman, 1973a
				MN	2	2	1	–		
		M/T	3	BN	9	42	5	4		Harman, 1973a
				MN	2	5	4	1		
26	Old Sleaford	I	1	MN	7	27	14	2	4	Higgs and White, 1963
		N	1–4	MN	9	16	2	1		Higgs and White, 1963
27	Fens (surface coll.)	N	2	BN	111	46	3	23	–	Hallam, 1970
28	Sedgeford	A	7–9	BN	199	430	55	37	–	Clutton-Brock, 1976
29	North Elmham	A	7–9	BN	456	1146	664	109	–	Clutton-Brock, 1976
30	Great Casterton	M	1b	BN	44%	33%	20%	–	9	Jope, 1968
31	Maxey	A	7–9	BN	194	191	59	42	3, 4	Seddon *et al.*, 1964
32	Brigstock	C	4	BN	46	80	11	–	3	Biek *et al.*, 1963
33	Lynch Farm	N	3–4	BN	344	63	12	n.a.	4, 5	Wilson, J., 1975
				MN	33	17	5	8		
34	Longthorpe	M	1b	BN	1,123	596	276	19	3, 5, 7, 9	Marples, 1974
				MN*	28	22	13	n.a.		
35	Stonea	N	2	BN	40	45	5	5	3, 4, 7	Barker, 1977
				MN	9	12	2	2		
36	Hockwold	N	2	BN	132	120	15	39	4, 7	Cram, 1967
37	*Tripontium*	R	3c–4	MN	7	11	2	8	6, 7, 9	Noddle, 1973
		R	4	MN	7	10	4	7		Noddle, 1973
38	Brixworth	V	2b	BN	23	92	8	4	3, 4, 7, 9	Clarke, 1967
				MN	2	6	2	1		
39	Overstone	N	3–4	BN	480	308	36	39	3	Harman, 1976
				MN	22	24	11	3		
40	Hardingstone	I	1	BN	489	599	141	124	4, 7	Gilmore, 1969
		N	1	BN	379	473	140	81		Gilmore, 1969
41	Quinton	I	1	BN	7	7	4	–	4	Field, 1974
		V	2	BN	66	104	37	19		Field, 1974

Table 4 Quantified bone reports from Roman sites in Britain, with additional Iron Age and Saxon data (continued)

Site no.	Name	Type	Date	Method	Cow	Sheep/ goat	Pig	Horse	Other information	Sources
42	Bourton Grounds	N	1	BN	48	34	5	5	9	Turnbull, 1975
43	Bradwell	V	4	BN	562	254	337	29	9	Westley, 1975
44	Godmanchester	R	1–2a	MN	45%	27%	23%	1%	–	Green, 1975
		R	2a	MN	56%	20%	22%	1%		Green, 1975
		R	2b	MN	57%	32%	19%	2%		Green, 1975
		R	3a	MN	47%	26%	21%	3%		Green, 1975
		R	3b	MN	57%	26%	10%	4%		Green, 1975
45	Earith	N	3–4	BN	74	88	12	17	4, 9	Phillipson and Gilmore, 1967
46	War Ditches	I	EIA	BN	15	94	–	2	–	Phillipson, 1964
		N	1	BN	99	96	27	12		Phillipson, 1964
47	Wicken Bonhunt	A	8–9	MN*	170	100	300	n.a.	9	Macready, 1976
48	Stonham Aspal	V	3–4	MN	10	8	4	1	–	Harcourt, 1966
49	Hacheston	R	2	BN	126	117	37	5	3, 4, 5	King, n.d.a
				MN	15	16	6	2		
		R	3	BN	682	160	45	9		King, n.d.a
				MN	27	19	8	4		
		R	4	BN	24	9	–	–		King, n.d.a
				MN	3	3	–	–		
50	Colchester	T	1b	MN	10	7	5	–	–	Heath, 1971
		T	2a	MN	3	1	1	–		Heath, 1971
		T	2b	MN	3	1	2	–		Heath, 1971
		T	1–4	BN	29	7	9	3		Cornwall, 1958a
51	Croft Ambrey	I	EIA	BN	24%	40%	36%	n.a	4, 7, 9	Whitehouse and Whitehouse, 1974
				MN	29%	40%	31%	n.a		
		C	2	MN	14	4	7	–		Whitehouse and Whitehouse, 1974
52	Sutton Walls	N	1b	BN	56	49	33	1	3	Cornwall, 1953a
				MN*	15	10	5	1		
		N	2	BN	55	49	11	3		Cornwall, 1953a
				MN*	4	6	1	1		
		N	4c	BN	63	51	33	6		Cornwall, 1953a
				MN*	7	8	3	1		
53	Astley	N	4–5a	BN	338	148	59	56	3, 9	Westley, 1960
				MN*	25	19	11	7		
54	Beckford	I	1a	BN	134	115	27	156	3, 4, 5, 7, 9	Gilmore, 1972
				MN*	7	12	6	6		
55	Gloucester	T/M	2–4	BN	69	28	19	2	–	Cowley, 1963
56	Cirencester	T	4c	BN	299	150	131	19	3, 4, 5, 7	King, 1975
				MN	17	15	12	3		
57	Ducklington	N	3–4	BN	41	7	–	–	5, 9	Wilson, R. 1975c
				MN	4	2	–	–		

58	Shakenoak	V	1c–4c	BN	329	211	106	81	9	Brodribb *et al.*, 1971
		V	2b–4c	BN	1,828	999	692	195	–	Brodribb *et al.*, 1968
		V	3–4	BN	599	306	221	48	–	Brodribb *et al.*, 1973
		V	3a	BN	13	10	5	2	3, 4, 5, 7, 9	Cram, 1973
		V	3c–4	BN	514	200	94	47		Cram, 1973
				MN	19	26	18	3		
		V	4c	BN	151	94	33	13		Cram, 1973
				MN	9	18	7	2		
		A	5a	BN	86	17	1	40	4	Jewell, 1968
		A	5–6	BN	802	1,347	641	289	6, 9	Brodribb *et al.*, 1972
59	Rainsborough	I	EIA	MN	50	66	16	6		Banks, 1967
60	Alchester	T	1–2	BN	68	89	25	8	–	Marples, 1975
61	Cassington	A	5–6	BN	43%	12%	29%	8%	–	Wilson, 1962
62	Seacourt	N	2–4	BN	17	5	1	3	3	Jope, 1962
				MN	4	1	1	1		
63	Abingdon	N	1	BN	3	11	4	–	–	Wilson, R., 1975a
		N	2a	BN	4	7	1	–	–	Wilson, R., 1974
		N	2	BN	14	5	–	–	9	Wilson, R., 1975b
		N	3	BN	4	9	–	–		Wilson, R., 1975b
		N	4	BN	8	12	5	–		Wilson, R., 1975b
64	Latimer	V	2b	BN	18	30	9	–	5, 9	Hamilton, 1971
		V	3a	BN	9	3	2	–		Hamilton, 1971
		V	3c	BN	100	10	21	–		Hamilton, 1971
		V	4a	BN	10	5	7	–		Hamilton, 1971
		V	4c	BN	170	2	28	2		Hamilton, 1971
		A	5a	BN	196	18	24	6		Hamilton, 1971
65	Gadebridge	V	1–2	MN	8	15	9	2	4, 7, 9	Harcourt, 1974
		V	4	MN	12	7	5	2		Harcourt, 1974
66	*Verulamium*	T	2a	BN	29	8	12	2	9	Cornwall, 1953b
		T	2a	BN	8	6	–	–		Cornwall, 1953b
		T	2b	BN	137	20	19	–		Cornwall, 1953b
		T	2c	BN	35	8	3	–	9	Cornwall, 1953b
		T	4a	BN	17	1	2	–		Cornwall, 1953b
67	Park Street	I	1a	BN	4	4	12	1	3, 7, 9	Jackson, 1945
		V	1–2	BN	22	7	1	3	3	King, 1961
		V	4	BN*	45	3	7	–	3, 7, 9	Jackson, 1945
68	Coygan Camp	I	EIA	BN	53	20	4	–	7	Westley, 1967
		I	1	BN	381	101	97	5		Westley, 1967
		N	4	BN	2,907	807	887	40		Westley, 1967
69	Dinas Powys	A	5–7	BN	340	224	1,025	n.a	4	Alcock, 1975
70	Caerleon	M	1c–3c	BN	51	4	20	5	7, 9	Watson, 1928
		M	1c–2a	BN	47	8	21	–	3, 7, 9	Cowley, 1932
				MN*	4	1	3	–		
		M	2	BN	39	11	32	9		Cowley, 1932
				MN*	5	1	5	1		
		M	3	BN	8	1	5	–		Cowley, 1932
71	Shipham	V	4b	MN	4	21	12	2	5, 7, 9	Davies, 1964
72	Cadbury Congresbury	A	5–6	BN	612	151	533	n.a	4, 5, 7	Noddle, 1970
				MN	97	43	87	5		

Table 4 Quantified bone reports from Roman sites in Britain, with additional Iron Age and Saxon data (continued)

Site no.	Name	Type	Date	Method	Cow	Sheep/ goat	Pig	Horse	Other information	Sources
73	Butcombe	I	EIA	BN	48%	48%	2%	1%	4	Everton, 1968
		N	3–4	BN	47%	51%	1%	1%		Everton, 1968
		N	4c	BN	46%	49%	1%	3%		Everton, 1968
		I	EIA	MN	10	14	4	1	4, 5	Everton, 1970
		I	1	MN	21	56	12	5		Everton, 1970
		N	3–4	MN	17	60	3	1		Everton, 1970
		N	4c	MN	2	8	–	1		Everton, 1970
74	Stokeleigh Camp	I	EIA	MN	9	11	9	3	4, 5, 6, 9	Everton, 1975
		I	1	MN	9	6	5	1		Everton, 1975
		N	3–4	MN	11	17	14	3		Everton, 1975
		N	4	MN	7	10	5	1		Everton, 1975
75	Budbury	I	EIA	BN	971	1,067	220	86	7, 9	Westley, 1970
76	Durrington Walls	N	3–4	BN	141	243	26	27	3, 7	Westley, 1971
				MN	6	6	2	2		
77	Ufton Nervet	N	1–2	BN	18	1	–	1	3	Westley, 1974
		A	6	BN	12	48	–	3		Westley, 1974
78	Cox Green	V	2–3	BN	5	7	1	1	3	Cornwall, 1962
		V	4	BN	11	12	12	–		Cornwall, 1962
79	Hawk's Hill	I	EIA	BN	234	738	274	49	4	Carter and Phillipson, 1965
80	Ewell	R	1b	BN	35%	45%	7%	14%	4	Done, 1973
		R	1b	BN	55%	36%	5%	4%		Done, 1973
		R	2a	BN	35%	55%	6%	4%		Done, 1973
		R	2a	BN	31%	53%	13%	–		Done, 1973
		R	2a	BN	22%	58%	6%	14%		Done, 1973
		R	4c	BN	27%	18%	–	56%		Done, 1973
		R	ALL	BN	35%	47%	8%	10%		Done, 1973
81	Brentford	R	2a	BN	8	1	–	–	–	Sutton, 1976
		R	2c–3	BN	21	5	1	4		Sutton, 1976
		R	4	BN	15	4	4	–		Sutton, 1976
82	Whitehall	A	9	MN	57	54	26	2	3, 4	Chaplin, 1971
83	Huggin Hill	T	1c–2	BN	20	8	18	–	5, 9	Clutton-Brock and Gask, 1976
84	Mermaid Theatre	T	4+	BN	171	58	98	2	3	King, n.d.b
				MN	5	4	7	1		
85	Aldgate	M	1b	BN	175	7	7	–	3, 4, 5	Watson, 1973
				MN	12	2	2	–		
86	Southwark	R	1b–2	MN	107	35	70	7	4, 5, 7, 9	Rixson, 1974
87	Old Ford	N	4	MN	117	38	15	6	3, 4	Rixson, 1971
		N	4	MN	37	6	6	5	3, 4, 7	Rixson, 1972
88	West Wickham	N	1–2a	BN	21	9	5	1	4	Harman, 1973b
				MN	4	3	2	1		
89	Keston	A	6	BN	13	17	50	–	4	Harman, 1973b
				MN	2	2	8	–		

90	Darenth	V	3c–4	BN	25	14	18	3	4	Harman, 1973b
				MN	4	4	6	1		
91	Eastwood	N	1c	BN	39	19	3	9	7	Coy and Chaplin, 1963
				MN	7	9	2	2		
92	Chalk	V	4a	BN	199	81	64	60	–	Eastham, 1972
		V	4	BN	30	27	9	19		Eastham, 1972
		V	4c	BN	135	58	83	21		Eastham, 1972
93	Sandtun	A	6–8	BN	71	96	16	1	–	Clutton-Brock, 1976
94	Mawgan Porth	A	9–11	BN	506	577	37	18	–	Clutton-Brock, 1976
95	The Rumps	N	1	MN	4	19	5	–	7	Chaplin and Coy, 1964
96	Westonzoyland	N	1–2	BN	65	58	20	28	9	Sheldrick, 1969
97	Glastonbury Tor	A	5–7	MN	17	17	7	n.a	4, 5, 7	Harcourt, 1970
98	Waddon Hill	M	1b	BN	40	49	3	4	9	Askew and Westley, 1964
99	Hod Hill	I	1	BN	67	276	59	24	3, 9	King, 1968
		I	1	BN	14	129	8	–	3	Bunting and Verity, 1968
		M	1b	BN	70	367	57	1	9	Fraser, 1968
100	Tollard Royal	I	1a	BN*	98	65	19	72	5, 6	Bird, 1968
101	Rotherley	N	1–3	BN	1,201	1,460	106	660	3, 7	Pitt-Rivers, 1892
102	Woodcuts	N	1–4	BN	1,639	1,206	531	420	3, 7, 9	Pitt-Rivers, 1892
103	Woodyates	N	1–4	BN	1,353	1,215	73	945	3, 7, 9	Pitt-Rivers, 1892
104	Eldon's Seat	I	EIA	BN	648	713	66	28	3, 4, 5	Phillipson, 1968
105	Twyford	V	1c–2a	MN	7	4	4	–	3	Chaplin and Atkinson, 1966
		V	2b–3c	MN	2	4	1	3		Chaplin and Atkinson, 1966
		V	4c	MN	7	15	6	5		Chaplin and Atkinson, 1966
106	*Clausentum*	R	1–2	BN	145	17	4	–	5	Bilton, 1958
		R	1c	BN	72	11	12	–	5, 9	Cornwall, 1958b
		R	2b	BN	16	1	1	–		Cornwall, 1958b
		R	3a–4b	BN	24	2	2	2		Cornwall, 1958b
		R	4c	BN	75	11	24	–		Cornwall, 1958b
		R	4c–5	BN	124	35	75	4		Cornwall, 1958b
107	Wallington Military Road	I	EIA	BN	25	35	20	39	3, 4	Alderman *et al.*, 1974
108	Portchester	R	4a	BN	3,474	1,067	998	27	3, 4, 5, 6, 7, 9	Grant, 1975
				MN	59	46	68	1		
		R	4b	BN	1,813	551	426	17		Grant, 1975
				MN	30	25	30	1		
		R	4c	BN	3,457	878	700	59		Grant, 1975
				MN	78	40	43	3		
		R	4a–b	BN	1,934	696	510	14		Grant, 1975
				MN	47	38	38	1		
		A	5–8	BN	553	197	138	21	3, 4, 5, 6, 7, 9	Grant, 1976
				MN	12	10	5	1		
		A	8–10	BN	5,074	2,695	1,719	72		Grant, 1976
				MN	117	223	216	4		
		A	10–11	BN	1,029	626	385	46		Grant, 1976
				MN	20	36	28	2		

Table 4 Quantified bone reports from Roman sites in Britain, with additional Iron Age and Saxon data (continued)

Site no.	Name	Type	Date	Method	Cow	Sheep/ goat	Pig	Horse	Other information	Sources
109	Neatham	R	2	BN	35	46	7	1	3, 4, 5, 7	Done, n.d.
				MN	5	11	3	1		
		R	3a	BN	97	126	19	40		Done, n.d.
				MN	10	26	6	2		
		R	3c–4a	BN	233	76	61	3		Done, n.d.
				MN	18	17	11	2		
		R	4b–c	BN	598	151	62	21		Done, n.d.
				MN	48	26	17	3		
110	Elsted	V	4	BN	269	236	30	20	4	Saunders, n.d.
				MN	6	11	2	1		
111	Fishbourne	M	1b	BN	316	334	486	6	3, 4, 5, 6, 7, 9	Grant, 1971
		V	1–3	BN	295	198	344	25		Grant, 1971
		V	3c	BN	145	89	110	16		Grant, 1971
112	Chichester	M	1b	BN	77	–	–	–	5	Outen, 1971
				MN	5	–	–	–		
113	Slonk Hill	I	EIA	BN	14	30	11	–	–	Gebbels, 1974
		N	1–4	BN	14	33	16	–		Gebbels, 1974
114	Highdole Hill	N	1–4	BN*	25	10	14	7	7	Jackson, 1936
115	Newhaven	V	1–2	BN	181	119	35	30	3, 5, 7	Gebbels, 1974
				MN	27	17	13	5		
116	Bishopstone	I	EIA	BN	87	128	24	42	3, 5, 7	Gebbels, 1974
				MN	12	10	9	6		
		N	1–4	BN	83	200	24	30		Gebbels, 1974
				MN	12	15	5	3		
		A	5–8	BN	10	8	1	2		Gebbels, 1974

Notes

References to unquantified reports and those with very low numbers can be found in King (1975). No figures are given here for deer, dog, or cat.

Abbreviations

Type of site: M = military, V = villa, T = town, R = 'Romanised' settlement, N = native settlement, C = temple or cemetery, I = Iron Age, A = Saxon.

Date: The figures denote centuries AD. EIA = early Iron Age (8th to 1st centuries BC), a, b, c denote early, middle and late respectively.

Method: BN = numbers of bone fragments. MN = minimum number of individuals (see text, p. 209). An asterisk indicates that the numbers have been estimated.

Other information: The numbers refer to the sections in Table 1, and give some indication of the scope of each report. No reference is made in this column to sections 1, 2 or 8 of Table 1.

cacy (most of the meat dishes in Apicius, *de re coquinaria* are based on pork) and it may have been fashionable, or politic, for tastes in Britain to adjust accordingly. By the time of Diocletian's price edict it was also economic to do so, for the maximum price of beef or mutton was 8 *denarii* a pound, while pork commanded 12 *denarii* a pound (Frank, 1940: 324). Cultural factors such as these were probably as, if not more, important than environmental constraints to the Romano-British farmer and must be evaluated as such in the interpretation of his refuse.

Having discussed aspects of the major trends visible in the evidence, it remains to comment on some of the many minor points. The nature of certain military deposits demands attention as they appear to represent a different treatment of refuse from other sites. Pits filled solely with split and abraded fragments of ox bones have been noted from Little Chester (23), and two foreign sites, Zwammerdam (Van Mensch, 1974) and Xanten, Colonia Ulpia Traiana (Waldmann, 1967: Table 4). The proportion of different parts of the body is similar in each case, consisting almost entirely of long bones broken into small fragments. As Van Mensch suggests, the primary reason for these collections of bones is boiling for broth. After using them in such a way, however, they were probably kept on the boil in order to extract bone grease or marrow fat which could be skimmed off the surface of the boiling water (Leechman (1951) describes the process being carried out by North American Indians). This could be used for cooking, as a substitute for butter or for elementary waterproofing.

The high proportion of cattle bones found in these deposits is reflected by military sites generally. Fig. 3 shows that 8 out of 17 deposits on military sites or six out of nine post-1st century military deposits have 75% or more cattle bones. This must represent a diet of 90% or more by weight of beef, and reveals how important cattle were in the military economy, particularly in view of the large range of other bovine products. It is also a reflection of the Highland disposition of most of the forts, given that supply was local (Manning, 1975), and a further indication that the army was patrolling areas with far less clearance than the sheep moors in existence today (see note at the end of the text).

Horse bones have always presented a problem to the archaeologist, for it is not easy to decide how regularly horse meat was eaten, if at all. None of the horse bones examined by the writer, or any referred to in the literature, has butchery marks of the sort usual in the other large domesticate, the cow, but this does not exclude the possibility of a method of butchery which does not involve chopping and dismemberment. On the whole, if horsemeat was eaten, its contribution to the meat economy was small, comparable to venison, and was probably only used on a casual basis, after, for instance, a young animal had died. Horse bones are generally rare in urban deposits, which supports the notion that the meat was not regularly consumed, for if the towns were supplied from the surrounding area with horsemeat as well as with products from the other domesticates, the numbers of bones surviving would probably be much higher.

The bone evidence gives the impression that horses were not common in the Roman period, and that they were kept to an old age, for they must have been far more useful

alive than dead. Assemblages with many horse bones are usually from sites where ranching would have been one of the major farming activities, such as in the Fens (27, 36) where air photography confirms the existence of droveways and stock enclosures (Phillips, 1970) or the Somerset Levels (96). Most of the Iron Age sites in Table 4 have relatively high proportions of horse bones, probably indicating a similar type of economy. It is possible that numbers of horses declined in the early Roman period due to the more settled times and the waning of a horse-using aristocracy, and to the demand by the army for corn, which may have increased the arable area and reduced ranching activity.

Anglo-Saxon deposits have been included in the data in Table 4 and the figures. In most cases the evidence they present is consistent with the continuity or at least the legacy of Roman dietary preferences and husbandry. Figs. 3 and 4 display no significant grouping of Saxon deposits except for three outliers which have remarkably high proportions of pig bones. These are Dinas Powys (69), Cadbury Congresbury (72) and Keston (89). The evidence from Dinas Powys has been disputed on the grounds of the selectivity of the sample (Chaplin, 1975), but in view of the existence of similar assemblages, it could be that the sample is, in fact, representative. The high proportion of pig bones is not easy to explain except in terms of food preference, and the bones may, as Alcock suggests, be the remains of food-gifts. Several of the other Saxon deposits contain high proportions of sheep bones and this trend is one that gathers momentum during the Middle Ages until Iron Age proportions of sheep are equalled and often exceeded by the 16th century. The only Saxon site with periodisation of the bone deposits, Portchester (108) clearly demonstrates this trend.

Conclusion

It is hoped that this study may serve as a base for more detailed regional analyses when there is a greater density of sites with reports on faunal remains. Much can be gained from studies of this sort, mainly in the form of temporal or cultural trends in the observable patterns. The evidence is easy to obtain but the interpretation, especially during the Roman period, hazardous. In particular, the role of the administration in influencing and changing prevailing economic systems is little understood but was probably extensive. Many of the trends noted may be due to that nebulous process 'Romanisation', which was the major dynamic factor of the period. Other influences, notably climatic and environmental change, were undoubtedly also operating throughout the Roman occupation and it is probable that some of the trends presented here are man's reaction to such natural changes. Whatever the relative weight of such factors, the study of the bones in Roman assemblages will continue to provide valuable evidence of ancient diet and ancient agriculture: the single most important activity in the Empire.

Note

Since this article was written a number of new reports have appeared, none of which alter the conclusions made here. A report on a deposit of bones from outside the

fort at Lancaster was, however, overlooked (in *Contrebis*, 2, part 2, 1974: 17–18) and this together with other evidence from military sites in Europe with distinctive proportions of bones is to be the subject of a further article.

Abstract

A number of bone reports concerning Roman Britain were examined. The main conclusions are as follows:

1. The methods of counting bone fragments and deriving minimum numbers of animals are directly, if conditionally, comparable.
2. The number of bones per animal increases with the size of the sample.
3. The number of bones per pig is less than for other animals. The loss of a greater proportion of post-cranial elements due to differential erosion or, less possibly, butchery practices, accounts for this.
4. There is a distinct trend away from making use of sheep through the Roman period, probably due to the location of more sites in areas better suited to raising cattle or pigs.
5. Deer bones are more commonly found on late sites than early ones, indicating increasing hunting activity and corroborating conclusion 4 in that the location of sites conducive to cow and pig tend to be woodland, the preferred habitat of deer.
6. 'Romanised' sites show the trend away from sheep more markedly than native sites. Pressure from central government may account for the increase in pig-keeping, since laws were attuned to the Mediterranean region where pig was a common animal.
7. Many military deposits have unusually high proportions of cattle bones. In one case this is probably due to the large-scale boiling of bones for grease. Cattle were preferred by the military perhaps because of the situation of most forts in the Highlands and perhaps because of the usefulness of their non-meat products.
8. Horse meat was not regularly consumed and most sites have few bones. Certain areas, such as the Fens, were devoted to ranching and this is reflected by the higher proportion of horse bones.
9. Anglo-Saxon deposits are not markedly different from Roman ones, except for evidence of the beginnings of the Medieval reversion to a sheep economy.

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A technical note on the radiography of two Roman military diploma fragments

by K. W. TUBB

At the suggestion of Dr M. Roxan, prompted by J. Driehaus's article,[1] a fragment of a military diploma belonging to C. N. Reeves[2] was radiographed in an attempt to decipher certain letters. The machine used for this purpose was a Faxitron and the X-ray film was Kodak's Industrex D, 18 × 24 cm (plate size).

In examining archaeological objects of this type, the following procedure is adopted. The object to be radiographed is placed on top of the film, beneath the X-ray tube of the machine. Depending upon the size of the object, several exposures can be recorded on each plate, provided lead sheeting be used to shield the film in all parts other than that directly beneath the object being radiographed. The plate can also be shifted so that the area to be exposed at any given time is at the centre of the cone of emergent radiation where the X-rays are most intense and homogeneous. The exposed radiograph is developed in the same manner as photographic plates.

In the case of C. N. Reeves' military diploma fragment which is 1 mm thick, 11 exposures were given, twice each, so that for each exposure both surfaces of the object could be closest to the plate. In this particular instance, this latter refinement did not affect the result. The other variables adjusted were the kilovoltage, or penetrating power of the X-rays, and the length of time of the exposure. These varied from 60 keV at 15 seconds to 100 keV at 30 seconds. Satisfactory results were obtained with exposures of 80 keV at 15 and 30 seconds, 90 keV at 15 and 30 seconds and 100 keV at 15 seconds. An exposure of 70 keV at 30 seconds was somewhat under-exposed and an exposure of 100 keV at 30 seconds was over-exposed. The results achieved for this military diploma fragment were most satisfactory and did, in fact, help to elucidate problems in its reading (see Figs. 1–3).

A second military diploma fragment from Colchester (*CIL*, **XVI**: 130)[3] was also radiographed. This object had previously been conserved presumably using chemical and/or electrolytic methods, and the removal of the corrosion products was complete. Unfortunately, as anticipated for the reason stated below, the radiographs revealed nothing more than that which could already be easily observed visually. However, the

[1] Driehaus, J. 1968. Archaologische Radiographie. *Archaeo-Physika*, **4**: 76 pp.

[2] The fragment of a military diploma belonging to C. N. Reeves is to be published by him and also by Dr M. Roxan in her book *Roman Military Diplomas Published Between 1954–1977*, London 1978.

[3] By kind permission of G. M. R. Davies, Assistant Curator, Colchester and Essex Museum.

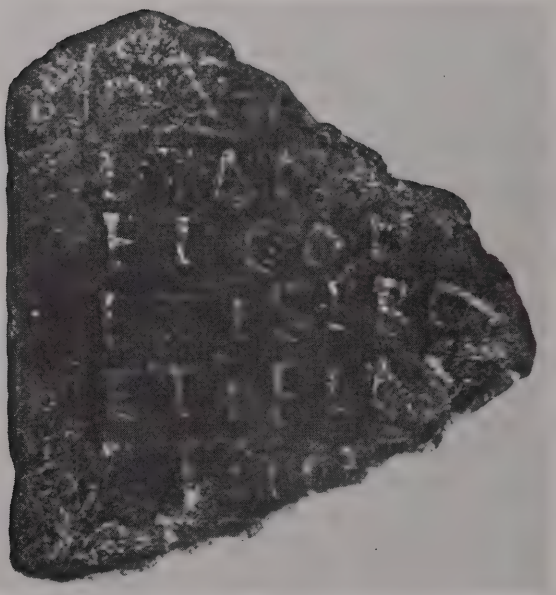

Plate I Outer face of C. N. Reeves' military diploma fragment.

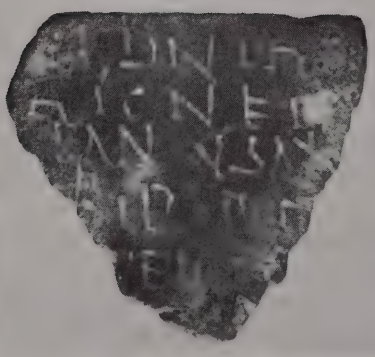

Plate II Inner face of C. N. Reeves' military diploma fragment.

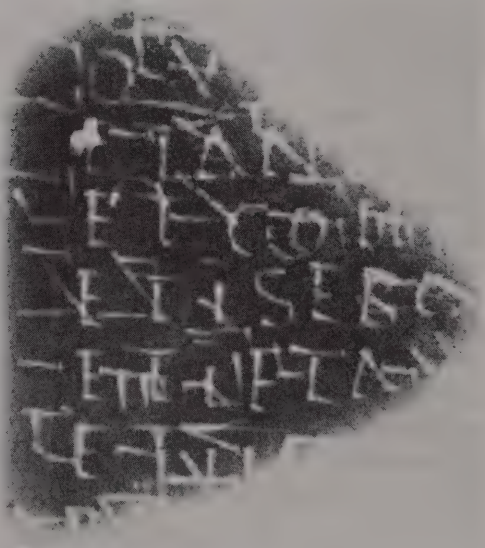

Plate III Radiograph at 90 keV for 30 seconds of C. N. Reeves' military diploma fragment.

exercise did illustrate the point that the retrieval of information by this method is best achieved before conservation is undertaken. Otherwise, it is likely that details preserved in the corrosion products will be permanently lost.

Despite the fact that the radiograph produces a picture of two superimposed inscribed surfaces, the results obtained suggest that military diplomas lend themselves to this kind of examination.

Acknowledgement

Photographs and photograph of radiograph courtesy of P. G. Dorrell, Lecturer in Photography, Institute of Archaeology.

Summaries of M.A. and M.Sc. Reports for 1976/77*

The Roman Army in the Severn Provinces of Osrhoene and Mesopotamia

The report is concerned mainly with the military arrangements for the new provinces. A discussion of the date of foundation of the provinces concludes that there is insufficient evidence for a reasonable assessment of the exact date. Examination of the epitaphs of the Parthian Legions produces some tentative evidence that they were raised with Danubian, Thracian and Eastern troops. With the auxiliaries it is suggested that there was a new series of regiments raised by the 190s possibly for the new provinces but certainly having strong connections with them. They embody new norms of size and structure. A list of the units serving in the provinces is included. A brief attempt has been made to look at the situation on the ground mainly to draw attention to the possible connection between the new auxiliaries and a new type of fort that appears in the provinces. Information is also included of a new stretch of the *limes* built behind the Djebel Sinjar. Finally, a summary is made of the careers of Ti. Cl. Subatianus Aquila and C. Iulius Pacatianus whose dates are crucial to the origins of the provinces.

Ian Caruana

Casting Moulds for Tools and Weapons from the Levant

Moulds made from stone or baked clay are found throughout the Near East from the mid-third millennium BC onward. The study of the moulds from the Levant reveals that a number of metallurgical traditions were present during the Middle Bronze Age. Excavations at most large Middle Bronze Age tells have uncovered large composite open stone moulds. These moulds were for the production of large numbers of objects such as chisels, flat axes and tanged daggers, and probably developed directly from the technique of casting in loose clay which seems to have always been a common method for the casting of small quantities of implements.

Two-piece moulds were found in large numbers at Byblos. Many were made of steatite. It is debatable whether these moulds were used for casting bronze implements or for making wax models for *cire perdue* casting. The evidence at present seems to indicate the latter but empirical work is required. Some two-piece moulds are constructed from limestone or schist and were used for casting bronze implements of Cretan and Anatolian shapes. The steatite moulds were for implements common in Mesopotamia, the Levant and Egypt.

Stone moulds are less common in the Late Bronze Age, and in the Iron Age moulds of stone and bronze were used for casting large numbers of arrowheads.

C. J. Davey

The Late Roman Pottery from Verulamium Theatre

The report was a re-examination of the later Roman pottery from the rubbish fill at Verulamium Theatre. Not all the original pottery finds were available, selection having been made in favour of rim, base and body sherds, and some having been lost while on loan to teaching collections. However, it was possible to establish the main fabric groups and to compare broadly the 'Black Earth' and 'Brown Earth' layers to test the significance of this division. The groups were established after close examination under a microscope at ×20 magnification, and comparison with known fabric types from the Department of Urban Archaeology's reference collection. The main groups, in order of size, were: a large group of Grey wares containing some Alice Holt pottery, but which could not be further defined, Calcite Gritted ware, Oxford ware, Hadham, Nene Valley, Black Burnished 1, Brockley Hill, Local and Portchester 'D' wares. Few significant differences could be established between the two

*Except where otherwise stated, *Reports* are housed in the Institute of Archaeology Library.

layers, except for a higher percentage of Calcite Gritted pottery and a greater range of Grey types in the Brown Earth. Apart from a little residual material, the pottery supported the late 4th century date established by the coins.

Sarah Geddes

Aspects of Musical Instruments in Ancient Palestine as Illustrated by Material from Neighbouring Countries

The main finds of musical instruments and their representations in Palestine have been listed and grouped together into three main categories: instruments of percussion, wind instruments and stringed instruments. The greatest amount of material has been found in the first category, since this included all instruments which could produce some form of sound by being shaken or hit, and did not require such a high technical ability in their construction as many of the instruments in the other two groups. The evidence is related in many cases to the literary evidence, which is used to fill in the background to the instruments, where little is known about them. It is sought to show that it is possible to construct a history of the emergence and use of musical instruments in Palestine without relying too heavily on or resorting wholly to the literary evidence, especially that of the Old Testament. It has also been found that more instruments, or representations of them, exist that was previously thought; in many cases it appears that originally instruments were not recognised when found and were listed under 'small objects', but without any photographic record of these it is impossible to locate them all merely from descriptions in the older excavation reports.

Linda Geffon

Epirus in the Bronze Age (Report housed in the Institute of Classical Studies Library)

The study of the Bronze Age in Epirus is difficult since the archaeological research is incomplete and there is no fixed date for the hand-made native wares and furthermore the material from Albania has not been dated definitely.

It seems probable that the pottery ware II is associated with the pre-Hellenic tribes while the ware III with an Indo-European population, the Thesprotoi.

There is no clear relation between the Albanian and the Greek tumuli since the dating of the first is uncertain. Hammond's theory about the 'Kurgans' is very weak and we have showed that at least the Grave Circles at Mycenae are not the burial-places of the 'Kurgan' chieftains.

The tholos tomb at Parga and the Mycenaean acropolis at Ephyra probably imply that the 'colonies' of Thesprotia were trading posts in order to facilitate the trade with central Europe and to control the sea-route leading up to Adriatic. The Mycenaean finds in Albania seems to support this view.

The last years of the Late Bronze Age are marked by the presence of a new pottery ware (IV). It is probably that new tribes, the Molossians, settled in Epirus and the finds from the Exalophos tumulus seems to prove the immigration of the Epirotes to Thessaly.

F. Lagari

A Variation of a Method of Microwear Analysis Developed by L. H. Keeley and its Application to Flint Tools From Tell Abu Hureyra, Syria

Microwear analysis of flint artifacts has in the past 15 years become a noteworthy research tool of archaeology. It was primarily the work of S. Semenov and his colleagues which incorporated microscopy into the study of the function of ancient stone implements, and showed how by experiment we may be able to determine the kinetics of tool use and the general hardness or softness of the worked material. Unfortunately, microwear research has had no underlying coherence, and this lack is due in part to the varied aims and methods of its practitioners. There is a general dearth of results which have an archaeological meaning. The work of L. H. Keeley is an exception. Keeley discovered that the polishes produced by various worked materials can be distinguished one from another at × 200 and that these, seen in relation to other wear traces, such as striations and edge damage can indicate the portion of the tool used, the specific worked material and the motion employed during use.

This study applies a variation of Keeley's method to a tool type, geographical location and time period heretofore unstudied by microwear analysis. First, an experimental programme was executed using the materials which were probably available to the aceramic Neolithic inhabitants of northern Syria. The relevant results and observations were applied to a group of burins from Tell Abu Hureyra with the result that the prehistoric burins were found to have been used primarily for engraving bone and wood. The burin as a tool type was thought, by ethnographic parallel and by archaeological association, to have been used as an engraving tool; now, a direct relation between tool type and

function is shown by microwear analysis. Further, some burins are shown to have been hafted or bound by grasses. The archaeological information gleaned from microwear analysis is technological and not economic, and the implications for technology extend beyond the tools themselves to encompass various worked materials and even the manner of exploitation of organic resources.

Emily Hays Moss

Saint Alban and Christianity in Roman Verulamium

Beginning with the accepted fact of the existence of St Alban as an historical figure, the report attempts to trace the evolution of Christianity in Verulamium through the Roman period. It seeks to link Christianity as represented by Alban with Christianity as represented by the great medieval abbey on the hill to the north of the Roman city. The material evidence is examined, with a discussion of the three buildings which have been suggested as possible Christian churches – the temple by the Theatre in Insula XVI, the apsidal building in Insula IX, and the building from the Verulam Hills Field site. The probability that there was a Roman church on the site of the medieval abbey church is also discussed. Evidence from literary and other sources is then used, along with possible parallels from Britain and Europe, to argue a possible framework for Christianity in Verulamium. A case is made which world allow three Christian churches in Verulamium at the cose of the 4th century and this is then equated with the material evidence. Finally, the probable development of Christianity in Roman Verulamium is outlined, while the need for further excavation in specific areas is stressed, in order for the hypothesis to be confirmed or adapted.

Michael John Noble

Bone Objects from the Excavations at Petra, Jordan

The number and variety of the bone objects found at the site of Petra is remarkable. The collection compares favourably with the published bone and ivory from sites such as Corinth, Delos and Benghazi and is superior to those of Dura-Europos and Olynthus. Its principal importance, however, lies in the method of fabrication employed: many of the pieces can tell us a great deal about the techniques used in the manufacture of bone and ivory artifacts in antiquity. The object of the *Report* is to lay before those who are interested in this subject an account of the various tools and objects which the Nabateans used for a long period, with the details of their actual processes of manufacture.

The method pursued was to make a complete examination of the material and then to classify it with parallels from other sites, according to function; classification according to date is not yet possible as the stratigraphy of the period is not yet published but the provisional date for the main part of the collection is the 1st to 2nd centuries AD. The total information gained was then arranged under the heading of each artifact.

The range of objects consists of pins, bracelets, buttons, counters, needles handles, furniture joints, spoons, knives and spatulae. An advanced lathe was used in Petra, and from the available material with lathe marks and with the help of medieval manuscripts one can be reconstructed. This may have been operated by a hand wheel, a pedal or driven by a belt. Many other tools, such as knives and chisels, were used.

The quantity and quality of bones left by the Nabateans should alone be sufficient to indicate how widely bone objects were used in the 1st and 2nd centuries AD at Petra.

H. M. Al Walda

Summaries of Undergraduate Reports for 1976/77

The Bronze Age in Shropshire – with Especial Reference to the Metalwork

Excavation supplemented by recent finds of Bronze Age material provide the *raison d'être* behind this general survey. Extensive use is made of both published and unpublished evidence throughout and the heavy debt to the work of Miss L. F. C. Chitty is duly acknowledged. Particular importance is placed upon the metalwork and the chapter divisions reflect this approach by taking account of the uneven chronological distribution of the evidence. While it is possible to describe the Shropshire Bronze Age in terms of reasonably coherent groups of metalwork, to which very generalised dates may be given, it is extremely difficult at present to show how these relate to the rest of the contemporary material culture. This problem led to the abandonment of the conventional divisions into Early, Middle and Late in favour of adopting vaguer terms such as 'earlier' and 'later', without necessarily intending to define specific periods of time. The material evidence for the 'earlier' Bronze Age is described at length in Chapter Two and reference is made to the important finds of Beaker material from recent excavations. All known finds of Early Bronze Age metalwork are included and the possible early exploitation of local copper ores is noted. Chapter Three continues the story into the 'later' Bronze Age and because finds of this date far outnumber all the material from the 'earlier' period it became necessary to place restrictions upon the large amount of material available for consideration – a selective procedure was employed and only material of particular interest or significance is discussed at length. Finally some of the main points raised in the text are evaluated and conclusions drawn. Two Appendices follow: Appendix A lists all available analyses of Shropshire Bronze Age metalwork and Appendix B lists every bronze implement known to the author up to March 1977. The programme of metallurgical analysis carried out on behalf of the Board of Celtic Studies (results forthcoming) and involving items of metalwork from Shropshire came to the author's attention too late for detailed consideration but it is hoped to be able to investigate the possibility that Shropshire copper ores may have been exploited in the Bronze Age at a later date.

R. J. Barnes

An Experiment to Examine Some Effects of Agricultural Implements on Flints: its Results and Implications

A practical experiment was designed to test the effects of agricultural implements on flints in the soil. The purpose of this was to examine the type and degree of damage, and the amount of movement which the flints underwent. One hundred flints were laid out in a field on the South Downs. The field was then ploughed, cultivated, harrowed, and drilled. At various times flints were recovered and examined. In all, a total of 25 flints were recovered for analysis.

After ploughing 17 flints were examined. Of these, 15 had sustained at least some damage. The damage ranged from a single tiny chip removed from the edge of a flake through continuous edge damage and invasive flaking to complete breakage. One or two pieces had extremely regular edge flaking quite similar to retouch. After cultivating, harrowing, and drilling, the rest were recovered. On the whole damage seemed of the same type as with the earlier sample, but more pronounced.

Movement ranged between about 2 and 10 m. The average for the first sample was 4.80 m, while the second was 6.20 m. This, like the damage, reflected the fact that there had been four stages of disturbance as opposed to one with the first sample. It was concluded that due to the degree of movement, surface scatters do not always directly relate to sub-surface sites, and can be confusing.

A. Betts

Medieval Masonry from Stratford Langthorne Abbey

Medieval masonry, originally from the Abbey of Stratford Langthorne, West Ham, London, and recovered from two sites in West Ham, is discussed in this report. The Abbey was a Cistercian house founded in 1135, dissolved in 1538 and demolished soon afterwards. The material consists of shaped,

moulded, decorated and painted masonry, mainly worked in Kentish ragstone, and includes several styles of mouldings, from the roll mouldings of the late 18th century to the double-ogee of the early 16th. The stone, most of it mainly from Kent or Surrey, displays a variety of tool marks, including saw marks, chisel marks, bolster toolings and punches, which also help to date the material to particular phases of building. There were also several masons' marks incised on to the stone. The painting on several of the moulded surfaces, a common feature of medieval church decoration, was found to be red ochre and lead white. The different styles of moulding, together with the tool marks and painting, all indicate several phases of building activity at the abbey site throughout the medieval period.

A. I. Blackwell

Soil Pollen Analyses from a Field System on the East Moor, Bodmin Moor, Cornwall

Soil and pollen analyses from various locations in a field system on the eastern margins of Bodmin Moor show the former presence of oak woodland in the area. The clearance of this oak woodland is accompanied by soil podzolisation, a process completed before the construction of a cairn and subsequently the field system. A cultivation phase prior to field system construction is postulated. There is no evidence for cultivation immediately preceding the growth of peat in the area. A reduction or abandonment of agricultural activity may have assisted the invasion of the peat-forming grass heath community. This community quickly reverts to a wetter type, presumably related to the late Bronze Age climatic deterioration. This process leads to the development of an iron pan superimposed on the podzol profile in the neighbouring plateau.

S. R. Clews

Landscape Features of the Iron Age in Essex

The object of this Report was to provide a beginning for research into Iron Age settlements in Essex, based on published (and some unpublished) excavation reports. This area had received little attention previously owing to lack of excavation and publication.

The term 'Landscape Features' includes defensive earthworks (hillforts) and several classes of crop-mark – field boundaries, trackways, enclosures, either singly or in integrated groups. Neither sites comprising groups of pits and isolated finds of pottery or coins were included as their information value was felt to be limited.

An attempt was made to divide the features into functional groups and especially to discriminate between defensive and non-defensive settlements. This was frequently difficult owing to lack of evidence or erosion of the earthworks.

The occurrence of these features was correlated with geographical features such as drainage, soil and relief in order to detect if any pattern of settlement was present.

Finally, a summary of the information was made, in order to draw conclusions on the nature of settlement in this area and the economy they supported, but owing to the partial nature of the evidence those were necessarily generalised.

Carol Crook

The Analysis of Seeds Recovered from Excavations at 199 Borough High Street, Southwark

After a brief outline of the geology and archaeology of Southwark the history of the study of seed remains from archaeological sites is surveyed, followed by an explanation of the various techniques for extracting seeds from archaeological deposits, and the problems that arise with each method. The reasons for use of particular sampling and seed-extraction methods in Southwark are explained, and the problem of interpreting seed evidence, due to variations between species of seed production, seed dispersal and differential preservation, are discussed. Typical environments of each of the 53 plant species whose seeds were recovered from the site are given, and also their potential use to man as food, etc. In conclusion it was found that the samples from 199 Borough High Street were too small, and that the many variables that influence the structure of seed assemblages from archaeological deposits are not fully understood, and further research is needed to make a better use of this potential source of information.

Martin Dean

SUMMARIES OF UNDERGRADUATE REPORTS 1976/77

Some Neolithic Flint Axes and a Surface Collection from Church Farm, Wiveton, Norfolk

This report attempts to provide information on the Neolithic flintwork to be found in North Norfolk in the absence of scientific fieldwork or Neolithic field monuments in this area. This project was motivated by and is based on an old collection of Neolithic flaked and polished flint axes from a farm in North Norfolk which has been supplemented by personal fieldwalking on the farm. This has produced a collection of surface flint finds which seems to be a fairly homogeneous Neolithic assemblage tying in with the collection of axes. There is no definite evidence of either Mesolithic or Bronze Age activity to be found amongst the flints recovered. The absence of pottery and the small sample of roughly datable tools admit of no more than a general Neolithic description for the material recovered.

The axes and the surface collection are described and discussed separately and the results are then considered together. These collections show widespread Neolithic activity over the whole farm. The large number of finds distributed in two particular fields suggests the possible location of some form of occupation site which might well repay further investigation.

Louisa J. Gidney

Techniques of Manufacture of Paisley Harness Woven Shawls

Shawls were manufactured in Paisley in Scotland from *c.* 1802 to 1880. The inspiration and standard were traditional Kashmiri textiles which were imported into Western Europe in increasing quantity from the latter half of the 18th century. Paisley shawls, and those from rival manufacturing centres, remained fashionable for a long period and now feature in many costume collections.

The research behind this dissertation was directed towards obtaining from library sources as much information as possible that would be relevant to a practical examination of these objects. It was grouped under three main headings: fibres and yarns, dyestuffs and weaving.

The great range of yarns available to the shawl manufacturers was discussed and the possibility of the use of Cashmere down considered, this being the material from which the traditional Kashmir shawls were made. The scarcity of specific references to dyeing in connection with the shawl trade reflects both the great secrecy which surrounded processes that might lead to commercial advantage and the status of the dyers' trade. Both the natural and synthetic dyestuffs available and the technique of warp staining were described, as were the looms and the weaving processes. Where possible points of reference for dating were established.

Alison F. Graham

An Evaluation of Geographical Survey Techniques in Archaeology

The steady increase in the amount of practicable geophysical techniques has provided the archaeologist with a number of discerning surveying methods. A proper understanding of the underlying principles and the limitations involved must be emphasised.

With magnetic surveying, detection of archaeological features relies on the magnetic soil susceptibility contrast between topsoil and subsoil. Therefore it is important to relate the geology of a site as the magnetic contrast does, to a certain extent, depend on it. A high iron oxide content allows greater conversion, enhancing the susceptibility mechanism and the inherently related detectability of archaeological features.

Magnetic surveying is most suited for occupation areas: hearths, kilns, pit and ditches, etc. Magnetometers generally cannot be used in buildings or build-up areas as stray electromagnetic currents and the proximity of ferrous metals, mask the signals. Grave sites tend to be problematic as ploughing jumbles up the contents and makes the grave fill identical to the surrounding soil, negating any magnetic contrast.

In such conditions electromagnetic methods come into their element. Metal goods in the graves would allow differentiation. For detecting metal and magnetic viscosity differences, the pulse induction meter (PIM) is most suited. For underwater archaeology, it has proven to be invaluable. The soil conductivity meter (SCM) should be used on sites with a shallow magnetic contrast as its depth penetration, in such conditions, betters that of the proton magnetometer. Future development should see a soil conductivity meter sensitive enough to be used as a portable soil susceptibility meter.

Resistivity is best used for the detection of walls and some earthworks. It has also, however, proven to be useful in determining the depth and stratigraphy of cave deposits prior to excavation as well as in locating unknown caves (*Masca Newsletter*, 6 (2), 1970). As the depth penetration of resistivity roughly equals the probe spacing, the larger the cave the better.

Coring and phosphate analysis should be complimentary to the above techniques allowing anomalies to be checked and survey areas to be delineated.

Seismic and other techniques can be used where the above mentioned methods have failed.

J. T. Hackman

The Comparison and Interpretation of the Flint Assemblages from the Neolithic Sites of Bullock Down and Offham Hill, Sussex

This report is a comparison between the flint assemblages from two Neolithic sites in Sussex, Offham Hill, a causewayed enclosure, and Bullock Down, an open settlement site. Both were excavated in 1976 by Mr P. L. Drewett, Director of the Sussex Archaeological Field Unit. Methods employed in the comparative section are reviewed, especially the measurement of waste flake length and breadth, as this flint type was the most numerous at both sites. Other approaches to this subject are discussed, including the method being developed by S. Ahler. Core and scraper classification methods are also considered.

Comparison and interpretation of the assemblages is undertaken, with especial reference to what extent flint assemblages alone can aid the archaeologist in determining the function of a site.

Brenda J. James

The Coins of Verulamium – a Quantative Study

This study falls into two parts and revolves around a reconsideration of the coins found in the Roman Theatre at Verulamium by Dr K. Kenyon in 1934. Part 1 is an assessment of the coins identified over the winter of 1976/77 at the Verulamium Museum. It is a summary of the contents of the Theatre collection in its constituent periods with a view to clarifying dating problems in the last period of the Theatre's use.

Part 2 is a quantitative study of all the coins-found in the Roman town of Verulamium from 1932 to 1976, with a view to assessing possible relationships between the various sites. An attempt has been made to demonstrate the development of the town through differential coin loss and the relationship of the coin loss in the town to that of the Province as a whole. Finally, a brief study of the relative proportions of coins supplied from the Western mints from AD 330–402 has been undertaken.

S. J. Keay

Preceramic Grave Groups from the Coast of Northern Chile (Collection of the Museum of Mankind, Catalogue No. 4–12, 1923, American Series. Nos. 1–289 and 382–399)

The material consists of worked stone, bone and shell, comprising a predominantly fishing technology. The purpose of the paper is descriptive, and the first part consists of a catalogue of items found in middens and graves. Following the catalogue, an attempt is made to evaluate the significance of the material within the context of the Pacific Littoral Tradition on the North Chilean Coast.

The paper is a preliminary one only, as due to difficulty of access to sources, not all the information needed was available. A final version is in preparation.

Geraldine Kelly

Pathological Anomalies in Sheep: a Methodological Approach

A methodology for recording pathological and other anomalies was devised using a sample of over 260 sheep mandibles from the Saxon site of Wicken Bonhunt in Essex, and drawing also upon archaeological and veterinary work from related and relevant subjects.

The report is in four parts. The introduction deals with the aims, and outlines the pathological anomalies which occur. The method presents, in detail, an analysis of the methodology, and gives instructions for its use, including a short account of the utilisation of the 'Olivetti' Intelligent Terminal facilities at the Ancient Monuments Laboratory. The third section is a detailed discussion of the results for each anomaly found in the material, and is concluded with a general comment on patterns and trends of the anomalies as a whole. A final section deals with further ideas and possibilities.

The report has over 30 plates and more than 25 text diagrams, graphs and illustrations. This was necessary because of the need to clearly illustrate and define the methodology and range of disease. It is hoped that this preliminary study of a subject hitherto almost ignored in archaeology will lead to a better understanding of the place of pathology as an important element of bone reports and that further work along similar lines will continue.

Bruce Levitan

A Technological Study of the 'Bronze' Brooches Excavated at Spong Hill, Norfolk, 1972–1976

Five seasons of excavation at the pagan Anglo-Saxon mixed cemetery have produced more than 60 brooches, the majority of which were examined and conserved by the author. Conservation procedures are documented, and some of the toolmarks and surface finishes exposed are illustrated in colour and black and white photographs.

The form and decoration of the brooches found are discussed; and reference made to their position within the grave, and the type of associated textile. In many cases one grave produced two layers of cloth, bearing brooches, possibly a tunic and cloak. A bast fibre, most probably flax, was identified.

Four brooches were selected for metallographic examination, and photomicrographs of each are presented and discussed. The samples were analysed on the scanning electron microscope, and found to be primarily copper, alloyed with varying small amounts of zinc and tin, and the occasional addition of lead. There appears to have been little attempt at compositional uniformity, corroborating the theory that scrap metal was remelted as a raw material.

The concluding section presents a suggested sequence of manufacture. Raw material; equipment (furnace, crucibles, moulds, and tools); casting and finishing processes (including gilding and silvering methods); and two ancient repairs are discussed in sequential order.

Julie Manser

Functional Groupings in Romano-British Pottery with Special Reference to Porchester Castle

Evidence is given to show that assemblages of Romano-British pottery of different dates have a different composition of functional types (e.g. jars, bowls, etc.). These changes are seen as cultural and are interpreted as being a result of the Romanisation of Britain. Against this background of the changing pottery assemblage, the Romano-British pits from Porchester Castle are reinterpreted. This reinterpretation shows that the excavated area was organised into areas of different activity.

M. J. Millett

The Neolithic Pottery of Sussex

This paper is a reconsideration of sites in Sussex yielding Neolithic pottery, in the light of Smith's analysis of the national situation (Smith, *British Prehistory*, 1974). The first section introduced the subject with a look at some of the problems of Neolithic pottery classification and a brief synopsis of Smith's survey. The next section deals with specific sites, beginning with the five causewayed enclosures in chronological order of excavation. The remaining sites are then examined; these include the oval barrow at Alfriston, the habitation sites at Bishopstone and Selmeston, and all the localities from which stray finds are adequately documented. As well as giving an overall picture of the Sussex Neolithic, this approach serves to highlight the individualities of the ceramic traditions of the county. In the concluding section the need for more carbon-14 dates was emphasised, preferably from well-stratified sites, in order to build up a pottery sequence that is related to an effective time-scale.

C. J. Preece

A Report on the Technology, Examination and Conservation of Portraits Painted in Egypt During the Roman Period

As the paintings discussed were primarily recovered in cemeteries within the region of El-Faiyum, they are frequently referred to as the 'Faiyum Portraits'. The date, purpose and materials employed in the production of these paintings is outlined, and a discussion of the origin, tools and execution of the encaustic painting technique is included, as the majority of the paintings were executed with a wax-based binding medium.

Specimens taken from paintings belonging to the Petrie Museum (University College, London) were examined. Identification of the wood support indicated the use of lime (*Tilia* species) and fir (*Abies* species). Gas–liquid chromatography revealed the utilisation of beeswax and 'Punic wax' as wax-based binding media; medium analysis of a portrait painted in distemper suggested the use of an egg tempera. An outline of the pigments and grounds which have been identified is given, and cross-sections prepared from paint samples are illustrated.

Conservation of the Petrie Museum paintings involved: (a) cleaning treatments for the removal of dirt as well as a layer of paraffin wax which had been applied in a previous restoration to those portraits possessing flaking paint, (b) re-attaching loose areas of the paint layer with a heated solution of polyethylene glycol 4000, (c) mending fractures in the wood support with a solution of polyvinyl butyral in iso-propyl alcohol.

Brian Ramer

Fish Remains from Point of Ayre, Orkney and Denton, Sussex

Two collections of fish remains were examined, from Point of Ayre, Orkney, and Denton, Sussex, both belonging roughly to the Medieval period; though very different geographically and environmentally. The Point of Ayre material contained cod, haddock, saithe, pollack, whiting, ling, hake, thornback ray, spurdog, an unidentifiable flatfish and at least two species of unidentified roundfish. An interesting, but as yet unexplained, feature of the Orkney material is the number of pathological oddities present, mostly centra but also including a pterygoid and a dentary. The Denton material contained cod, haddock, whiting, ling, conger, pike, chub, plaice, thornback ray and two unidentified species of roundfish.

The bulk of the Orkney material belongs to the family of the Gadidae and an attempt is made to provide a guide to the identification of the five main species present, with a summary of the most useful bones from the identification viewpoint.

A brief comparison is made between the Orkney and Sussex material and it is noted that, whereas with the Orkney material the ratio between bones and minimum individual fishes averages 10 : 1, with the Denton material it is only 3 : 1 and this is related to the probable original nature of each deposit.

P. A. Rhodes

A Die Study of the Gallo-Belgic A, B and C Coin Series in Britain

Better entitled 'Preliminary Speculations', etc., the author has tried in this report to keep his conclusions within the boundaries of the information imparted by the die study. Each series has produced evidence which prior to this study had not been recognised or fully appreciated.

The A series was notable for what are probably some form of identification marks on the Ab staters and perhaps on the Aa staters also.

From the B series the author deduced that the Ba and Bb series represent the amalgamation of two distinct coin manufacturing streams, signified by the defacement of the obverse dies, prior to any of the original dies being used for minting. This merger presumably took place at a time of political or economic stress. Is it possible that this could be related to Caesar's campaigns in Gaul?

The C series was less informative, but a central style typified by a hoard from Higham in north-west Kent was noted, with a number of 'semi-individualistic' dies revolving around these. It is possible that some of the latter were struck in Britain, but until a full study of the continental material can be performed this cannot be confirmed.

Robert P. Roberts

Application of the method of non-metrical Analysis to separate sheep populations

This report aims to show the possible use of non-metrical analysis for separating sheep populations. The method used was based mainly on that used by previous workers for studies of a similar sort on mice and men. Use was made of two quite separate sets of sheep skulls, one modern (from North Ronaldsey) and one archaeological (from Baynards Castle, London) and these were compared using 17 non-metrical variants. Some comparisons were made within the modern sample which showed it to be homogeneous as expected. When comparing the modern and archaeological samples, several

variants showed significant differences thus confirming the fact that the two populations under study were separate. Owing to the small size of the archaeological sample, only the simplest methods of comparison were used.

Thus it was shown that non-metrical analysis can be used to separate sheep populations and at the same time that it can be applied to archaeological material. Fragmentary material is usable in this type of analysis, but the main problem would usually be finding sufficient material to be statistically valid. It was thus suggested that in general comparison between populations of whole areas or whole periods would be more profitable than those of single sites.

I. Ruben

Benzotriazole: Ten Years On

This essay is divided into two main sections. The first section deals with the theoretical aspects of benzotriazole. Its chemistry, its stoichiometry, its copper complexes are discussed as well as various proposed mechanisms by which it is thought to bring about the inhibition of the corrosion of copper and its alloys. This section is prefaced by a brief discussion of inhibitors and co-ordination chemistry, both of which are necessary to the following discussions of benzotriazole.

The second section is a report of the experimental work undertaken by the author. These experiments are concerned with the conservator's use of benzotriazole for the treatment of antiquities made of copper and copper alloys. These experiments led to the conclusion that the actual composition of the alloy is not a factor in the effectiveness of benzotriazole as an inhibitor. As long as there is copper present, benzotriazole will be an effective inhibitor. The fact that a bronze has been cast, cold worked or annealed is also unimportant. Other experiments showed that treatment by immersion without vacuum is effective, the recommended immersion time being 15–30 minutes. No conclusions could be made concerning the effectiveness of aqueous over alcoholic benzotriazole. Both are equally effective.

Catherine Sease

The Application of Freeze-drying to the Conservation of Waterlogged Leather

The report concerns both research and experimental work on the freeze-drying of waterlogged leather after pre-treatment with polyethylene glycol 400 (PEG 400), a water soluble wax of low molecular weight. The process is based on a similar treatment for wet wood.

The leather is soaked for about a month at room temperature in a 10–15% solution of PEG 400 in distilled water with fungicide. After snap-freezing the pieces in dry ice/acetone, the leather is placed in a freeze-drier for 48 hours at $-70^{\circ}C$ and 10^{-1} Torr. After drying, the leather has a pleasing colour, flexibility, and texture. The role of the PEG is to stay behind after the ice is removed, pack the fibres, and satisfy hydrogen bonds in the degraded tannin and collagen that were vacated by the water. However, shrinkage averaged about 12–17%.

Two-thirds of the report also deals with an explanation of the basic physics and principles of freeze-drying for the conservator. Since quality and stability of material treated are crucial, a conservator using freeze-drying should be aware of aspects such as how the process works, what happens inside the material, and how damage can occur. Aspects covered include vapour pressure and sublimation, freezing, eutectics, permeability of material to vapour, conduction of heat to hasten sublimation, and variables in the freeze-drying apparatus which affect the performance. Damage to proteinaceous materials by freeze-drying is also discussed.

Katherine R. Singley

Book Reviews

PIGGOTT, Stuart. *Ruins in a landscape: essays in antiquarianism.* Edinburgh University Press, 1976. vii + 212 pp., 21 figs. £1.75 (paperback).

'I do not promise anything new in this brief enquiry, but there are points of interest which may not have been brought together before.' Thus says the author, at the start of one of the nine essays in this charming and instructive book. Yet one of the essays is new; the other eight have for this edition been edited or rewritten, and references added. The result can be warmly recommended as an instance of the whole being greater than the sum of its parts. We should all be interested in the history of our subject, and anyone who finds these discourses dull has only himself to blame.

In fact here is much more than a history of antiquarianism: only someone with a lifetime's accumulated erudition could have covered the range and depth of ideas presented here. The oddity of some of these past conceptions, as it seems to the modern reader, is to be looked upon as not merely amusing, but instructive as well; we can see our own position clearly only in the long perspective of history.

In nine essays of various dates occasional overlaps and repetitions are inevitable, but these serve to tie together the threads of thought in each. The development of antiquarianism is illuminated by such diverse topics as landscape painting, folklore, anthropology, the state of the roads, Tractarianism and literature; we meet Walter Scott, Marx, Stukeley, Aubrey, Camden, Newman. We have 17th century efforts to trace the steps of our ancestery back to Noah; the unanswered question of why Brazilian Indians appear on a 16th century Oxfordshire memorial tablet; the history of Camden's *Britannia*; 16th to 18th century attempts to equate Celtic and Saxon, all mixed up with Noble Savages and Druids; perhaps my own favourite, for entertainment value, the mystery of Colton's Field, which has echoes from Virgil to Lawrence Durrell via the Rosicrucians and Tsarist Russia; 18th century cabinets of curiosities and the change in attitude to landscape and thus geology and antiquaries; Scottish antiquaries, all notable characters; literary gibes at antiquaries in Scott, Peacock and others; and the emergence of county societies from Victorian religious movements and their cross-currents.

This is a cabinet of curiosities indeed, and more besides; and well presented in the always distinctive style of the Edinburgh University Press.

ISOBEL THOMPSON

BURGESS, C. and MIKET, R. (*eds*). *Settlement and economy in the third and second millennia BC.* Oxford, British Archaeological Reports 33, 1976. 331 pp., illus. £5.90.

Over 40 British Archaeological Reports have appeared in the past four years. This, number 33 in the series, is with the exception of BAR31 by far the largest (331 pages) and contains the papers delivered at the fifth Newcastle January Conference in 1976. These conferences, organised by the University of Newcastle upon Tyne Adult Education Department 'to examine in depth topical problems of pre-history', have been held biennially since 1969. But the latest, on the Settlement in the later Neolithic and earlier Bronze Age, was held only a year after the 1975 meeting and is the only one so far to result in a publication. Here, praise must go to the joint editors, Colin Burgess and Roger Miket, for assembling the 18 contributions so promptly, all of which make interesting reading. They range in time from that busy period of our prehistory when Grooved Ware and Peterborough pottery users were engaged in large-scale civil engineering works (not south of the border only, to judge from the fascinating site at Peebles) down to the time when Beakers had come and gone – their role now diminished (Chapter 18) – cremation was almost universally practised and metallurgy was entering the second (Taunton) industrial phase of the MBA, with its 'ornament horizon'. The period under consideration, therefore, covers just under 1,000 years, from *c.* 2200 BC to *c.* 1250 BC, which Colin Burgess divides into three phases in his Preface. The first phase (*c.* 2200–1700 BC) spans the traditional Late Neolithic, with early Beakers and the development of metallurgy (Stages I, II and even III) included, while the second (*c.* 1700–1500 BC) with late Beakers, new Food Vessels and cinerary urns, can be

equated with the full bronze technology of Burgess' Stage IV. The final phase (*c.* 1500–1250 BC) when cremation predominated includes the ever-more extended Deveral Rimbury complex, discussed in an important paper which was not actually presented to the conference.

The first six papers deal with the southern half of Britain. P. Catherall discusses Henge Monuments (Chapter 1) and underlines the enormous variation within this group, not only in size but also in internal features, while current views concerning their origin and function are questioned in the present state of our knowledge.

Two recent excavations of Late Neolithic sites are next described: the first, at Stacey Bushes, Milton Keynes, demonstrates the association and probable contemporaneity of Grooved Ware and Grimston (Fengate) pottery, and Stephen Green suggests that the two groups may have occupied separate ecological niches – Grooved Ware pastoralists living alongside a group practising mixed economy. The second is an interim report on recent work at the important Fengate site outside Peterborough, and is mainly concerned with the rectangular Bronze Age enclosures to the north and east of the Late Neolithic settlement. The enclosures are regularly laid out at right angles to the fen edge and could have been to conserve winter grass from overgrazing by herds returning from summer grazing out on the fen. Analogies with medieval economy are made; the emphasis is on pastoralism with little direct evidence of cereal cultivation; social organisation points to an aristocracy and cattle raiding is deduced from the discovery of a large fragment of Bronze Age spearhead in an enclosure ditch. An important point is made as a result of excavation at this and other sites in eastern England, namely that linear ditch systems on aerial photographs should not necessarily be consigned to the Iron Age just because they cut a ring ditch.

The important Cornish site of Gwithian has produced a wealth of information, including the Beaker house from layer 8 with associated pottery as well as the bronze pins and socketed axe mould from layer 3. All these are discussed in a welcome paper (Chapter 4) by Vincent Megaw, M. J. Rowlands and Colin Burgess – the latter taking this opportunity to propose a revised chronology for the later Bronze Age (Fig. 4.9).

The excavation of the plough-damaged earthwork at Litton Cheney, Dorset, follows next, with its internal structure – thought to represent a house – its cremation burials and a description of the (mainly) Collared Urn pottery by I. F. Smith.

An interim statement (Chapter 6) on the total excavation of a flint mine at Grime's Graves includes the impressive section, showing more than 10 m of shaft filling, and sets out clearly the evidence for attributing the mining operations to Grooved Ware people. On calculations carried out, the miners would have extracted some 8 tonnes of flint over all from the base of the shaft. One might reflect that, if these people were the civil engineers of British prehistory, modern excavators would need to use comparable expertise in exploring their monuments. Visiting the site and seeing the techniques used there by Roger Mercer and his team certainly reinforced this view.

Neolithic activity in the Milfield Basin, Northumberland, by Roger Miket and Beakers from Mortimer's Barrow 275 on Callis Wold take us to the north (Chapters 7 and 8), then across the Border to the great neolithic defences at Meldon Bridge, near Peebles – surely the most exciting discovery of this period since the timber structures of Durrington Walls. So far the site is unique but, as Colin Burgess points out, this whole area is little known and awaits archaeological exploration. The reconstruction drawings of the timber barrier and internal features are a particular delight.

Next come accounts of excavations on the machair of Western Scotland (Chapters 10, 11 and 12): the Mesolithic and EBA settlement at Kilellan Farm, Islay (Argyll), a Beaker settlement in the Outer Hebrides at Rosinsh (Benbecula), and a brief note on Northton, Isle of Harris, with its oval (? boat-shaped) stone structure in a Beaker midden. Last, but not least of the Scottish settlement sites comes Skara Brae and a paper by D. V. Clarke on the factors affecting interpretation of the Orcadian sites, in the light of past research, the current excavations and the ethnographic evidence.

A preliminary note on the Beaker material from either side of the Passage Grave mound at Knowth, Co. Meath, ends the reports on recent excavations and the last four chapters deal with specific aspects of later prehistory: trade (or rather *not* trade) is examined in a provocative piece by C. Stephen Briggs and many long-held beliefs concerning the distribution of raw materials are seriously undermined; work at Achnacree promises to shed light on the prehistoric landscape, and in Chapter 17 John Barrett discusses the Deveral-Rimbury problem. This paper explores the range of radiocarbon dates now available for the Deverel-Rimbury Complex, beginning now in the Early Bronze Age. A Late Neolithic Grooved Ware background is proposed, supported by the continuing use of cremation cemeteries; a number of interesting points are raised concerning burial tradition and social stratification, and the EBA/MBA transition is seen as a period of continuity rather than a hiatus.

The final chapter, in two parts, is a thought-provoking paper by Colin Burgess who presents an alternative explanation for the Beaker phenomenon and suggests that this may represent a 'non-ethnic cultural package' rather than a movement of people – 'the outward signs of an influential beer-drinking cult being spread from group to group across Europe' – and uses some ethnographic evidence in support of his theory. Continuity of ritual from Neolithic to Bronze Age in Britain is emphasised

and the dominant role of Beakers as catalysts in burial traditions is questioned. An urgent plea is made for the reassessment of the physical remains and above all for closer examination of the domestic evidence. In part two of the Beaker paper, Stephan Shennan comments on the European Beaker evidence and concludes that, in the early phase at least, association with a cult could indeed account for the spread of the Bell Beaker and its contents.

Altogether this is a rich, but not indigestible, collection of papers resulting from the Newcastle symposium. The production methods used, however, result in less than top quality photographs – a criticism which applies to others in the BAR series. But this is perhaps justified by the promptness of publication and the not unreasonable price of £5.90. It is certainly a 'must' for all prehistorians who, like this reviewer, find this period one of the most dynamic in British prehistory.

PATRICIA M. CHRISTIE

MATTHEWS, C. L. *Occupation sites on a Chiltern ridge. Part 1: Neolithic, Bronze Age and Early Iron Age.* BAR 29. Oxford, British Archaeological Reports, 1976. 208 pp., 9 pls., 123 figs. £3.90.

This report is concerned with 24 years work by members of the Manshead Society of Dunstable from 1951 to 1974 on a chalk escarpment reaching out from the main range of the Chiltern Hills near Dunstable where acres have been quarried away by chalk extraction. The account of work by members in their leisure time concerns itself with the prehistoric remains and was prepared substantially by C. L. Matthews. In addition, it contains a number of specialist reports and comment.

The area in question is dominated by the earthworks of the Maiden Bower causewayed enclosure (later to become an Iron Age hill-fort). The earliest remains recorded were the ditches of the Neolithic causewayed enclosure and a series of 11 pits along the ridge – all but one of which produced Grooved Ware sherds. North of the causewayed enclosure was recorded a Beaker burial containing a beaker of W/MR type, a bone toggle, stone bracer and a spiral-headed pin of true bronze with parallels in the Rhineland – one of the earliest bronze artifacts in Britain. Six sepulchral ring-ditches of Bronze Age date were investigated together with a contemporary settlement comprising a single round hut and settings of post-holes which produced fragments of collared urns. Settlements of this date are rare and this example is a welcome addition to the list. Occupation continued on the ridge throughout the Iron Age represented by enclosures, circular huts, four-post structures, working-hollows and storage pits. Sections were obtained of the ditch of the Maiden Bower hill-fort which produced some evidence for timber-work in the rampart and human skeletons in the ditch – including three decapitated adults. The final Iron Age settlement is represented by wheel-turned vessels, including some imported Gallo-Belgic forms, in a cremation cemetery and settlement.

A warm tribute must be paid to the enthusiasm and dedication of the members of the Manshead Group, who throughout the years gave up their leisure time so that the remains could be recorded before they were destroyed. Mr Matthews pays appropriate tribute to them and it is clear that the success of the work owes much to his leadership. The enthusiasm of members also extended to publishing the results of their field-work. The purpose of the report is frankly stated – to show the structures that were found together with their associated artifacts. This is achieved by means of a full text backed by drawings of sections and plans to standard scales associated with full illustrated accounts of the related finds. The result is a full record of prehistoric remains recorded by the group – much of it is more properly archival material but this in no way detracts from the achievement. Mr Matthews and the Manshead Society have produced a volume of permanent value and may feel justifiably proud with the first product of their labours.

G. J. WAINWRIGHT

HARDING, D. W. (*ed.*). *Hillforts. Later prehistoric earthworks in Britain and Ireland.* London, Academic Press, 1976. xiv + 580 pp. £24.00.

This volume is a weighty addition to a series of hillfort studies that have been recently published. The subject is one of great interest both to the academic and general public – we need only recall projects such as Maiden Castle, South Cadbury and Danebury to appreciate the strength of this appeal. Hillforts have therefore attracted excavations both on account of their intrinsic interest and on account of their situations which ensured that the work occurred in attractive surroundings – 'sky-lark' archaeology as it has been called. It is therefore entirely appropriate that their morphology, associated artifacts and interpretation should receive considerable attention – a view that has clearly been shared by several publishers in recent years.

This particular volume edited by Dr Harding is produced with a bold type-face and clear line drawings but the reproduction of the plates is not good and the reasons for their selection are frequently obscure. This is not a particularly important point but the volume is presumably intended for students rather than the informed lay-man and any economy to reduce this cost from £24.00 should have been welcomed. Furthermore, the book is unfortunately not easy to use – the figures and plates are not arranged sequentially but by chapter at the end of the volume and there are no content lists of figures or plates. The aspiring student editor should note in addition that the different methods of referencing between certain chapters is not a practice to be followed.

The volume contains 16 essays by archaeologists concerned with hillfort studies together with a preface by the editor. Within the volume the essays are grouped on a geographical basis but they can be assembled by subject matter as follows:

(i) Articles concerned with general topics comprise 'A student's introduction' (Avery), Welsh hillforts (Savory) and Vitrified forts of Scotland (Mackie). Avery's contribution is a wide-ranging survey of current knowledge regarding morphology, material remains, chronology, continental parallels and purpose of hillforts. It is heavily referenced, contains much that is new and should be a welcome mine of information for students. Similarly, the contributions by Savory and Mackie contain much fresh thought although a great deal of the data published by Mackie have appeared elsewhere.

(ii) Reassessments of old excavations by Hawkes of St Catherine's Hill and Jobey of Traprain Law.

(iii) The publication of excavations both old and recent by the directors who undertook the work. Six contributions occur in this category and in some cases appear to constitute definitive accounts. Dunning's welcome synthesis of his excavations at Salmonsbury comes into this latter category – his bold suggestion of cannibalism should be considered alongside the mounting evidence for excavation practices at this time. Other reports are on Almondbury (Varley), Blewburton Hill (Harding), Mam Tor (Coombs), Ravensburgh Castle (Dyer) and Leckhampton Hill (Champion).

(iv) Accounts of current excavations which were in progress at the time the texts were prepared (late 1972, early 1973). These are in some ways the least satisfactory papers as they have frequently been superseded by interim accounts of subsequent season's work. They include reports of work at Crickley Hill (Dixon), the Breiddin (Musson), Moel-y-Gaer (Guilbert), Dun Ailinne (Wailes) and Rathgall (Raftery). The Irish contributions, however interim, are especially welcome and Raftery's paper contains a discussion of Irish hillfort problems.

The volume concludes with a 24-page bibliography of enduring value together with author and subject indices.

It is difficult to identify consistent themes but the contributions are of interest in reflecting aspects of current academic enquiry. Chronology is a recurrent issue, backed by radiocarbon dates and artifacts which demonstrate that the forts may pre-date the first millennium BC. Considerable pre-occupation is apparent with hillfort defences, save by Guilbert, Wailes and Raftery in particular, although large-scale excavation of interiors is still a matter for the future. The future of hillfort studies is discussed by Avery who identifies three avenues to follow – data collection, chronology and total excavation of interiors – both of hillforts and related settlements. To these one would add the conceptual problems involved in perceiving the development of hillforts in the landscape and the organisation of field projects to set hillforts within the economic and social systems. The wholesale stripping of hillforts and settlements is not likely to be undertaken lightly in the light of recent experiences and on grounds of financial stringency. When the opportunity for such a project does occur due note should be taken of Guilbert's experiences at Moel-y-Gaer where a single ploughing would have destroyed the ephemeral evidence for the final phase of settlement.

One is grateful for the information and ideas contained in this volume. However, the price is high for a work of reference and despite the advantages in having a series of papers on one topic gathered together, much of the material could have been appropriately published in local or national journals.

G. J. WAINWRIGHT

BIRLEY, Robin. *Vindolanda.* Thames & Hudson, 1977. 184 pp., 15 colour plates, 84 monochrome plates and 45 line drawings. £9.50.

Being the first detailed appraisal on the recent work at Vindolanda to have emerged, this very readable book covers material which gives a clearer insight into civilian life on the Northern Frontier than has been hitherto possible.

Mr Birley introduces the reader to the subject by providing him with a very general background to the military history of Northern Britain down to the end of the Roman occupation; after a rather general summary of visible remains along the wall, the site of Vindolanda is then put into the perspective of recent frontier research, as well as the previous work of antiquarians and other archaeologists.

The following two chapters deal with the excavation, and a study of the finds from the *Vicus*; despite a general wealth of material and upstanding remains, the survey of the site and the picture produced is not really in enough depth to satisfy all the questions one might want to have asked. Similarly, the chapter on the small finds could have been more penetrating. One interesting aspect of the *Vicus* excavation, is the new data that it provides on the chronology of the wall periods in general; unfortunately a full discussion on the reasoning for the date table at the back is missing. And then one is a little surprised at the following paragraph which suggests that the end of the *Vicus* II period (AD 270–350), may have to be brought forward a century on the basis of the hoard found in the upper levels of the Vicus.

The next two chapters deal with the stone forts, and the wooden pre-Hadrianic ones respectively; the latter provide us with a very clear and interesting picture of the general waterlogged context of the wooden and organic material that was discovered with the famous writing tablets in the 2nd century *Fabrica*. The final chapters deal with the finds from the forts, the writing tablets, and the interesting replica constructions.

The overall feeling is one of patchiness – from the rather sketchy site plans, to the interesting final two chapters. As far as layout goes, it would have made easier reading to have had the occupational sequences running from early to late instead of vice versa. Finally, valuable as this book will be to the general reader, it might perhaps been brought closer to his grasp by cutting down on some of the (scale-less) small finds photographs.

SIMON. J. KEAY

DORE, John and GREENE, Kevin (eds.). *Roman pottery studies in Britain and Beyond.* BAR Supplementary Series 30. Oxford, British Archaeological Reports, 1977. 333 pp., 54 figs. £6.30.

This book, a *festschrift* for John Gillam, is dominated by studies which relate to Roman Britain. As such it is rightly compared to the previous volume edited by Detsicas (*Current Research in Romano-British Coarse Pottery,* C.B.A., 1973) which has become a standard work in the field. This new volume covers much of the same ground with contributions which bring us up-to-date. It has new contributors (several of whom come from the excavation units) and a greater number of articles on more varied subjects but there are few new ideas. The historical model still dominates the subject with its concentration on chronological problems and explanations which will seem to some of more concern to historians than pure archaeologists. The best contributions in this vein, by Dr Breeze and Mr Hartley, maintain very high standards and are of considerable interest. The majority in the same tradition are much less well designed and of lower standards. The problem in trying to present a pottery article is deciding how much evidence needs to be presented to support the conclusions drawn. Several of the articles, those by Mrs Bird and Mr Dannell for instance, solve this problem successfully: others however present too much evidence and are clouded by this detail. Information about specific excavations and individual finds needs to be disseminated but in county journals, not in a volume of essays which should be of more than insular significance. This problem together with the poor proof reading and reference checking, and the lack of a consolidated bibliography are presumably the result of the speed with which this volume was conceived and produced.

These drawbacks do not detract from several of the articles which make the volume well worthwhile. Those by Dr Fulford, Mrs Darling and Dr Breeze are particularly welcome for their awareness of what can loosely be called spatial factors. Nevertheless both these articles, and those which consider distributions show a lamentable failure to use quantified information and the more objective methods of analysis, such as those used so successfully by Dr Hodder to help in the interpretation of such data.

This volume is obviously going to be a valuable and necessary addition to the bookshelf of anyone working on Roman pottery from Britain, but having read it I was left with the impression that more thought needs to be given to the methods used. and the questions asked about the pottery. I believe much would be gained from a greater awareness of some alternative interpretative models, and more use of objective methods for the presentation and assessment of results. In this regard Dr Williams' article provides the only real breath of fresh air.

MARTIN MILLETT

JONES, Michael J. *Roman fort-defences to AD 117, with special reference to Britain.* Oxford, British Archaeological Reports 21, 1975. 192 + 18 pp., 6 pl., 21 figs., location map. £3.90.

M. J. Jones treats his subject in a thoroughly professional way. Beginning with the Republican camps excavated near Numantia and elsewhere in Spain, he proceeds via Caesar's works in Gaul and Augustan fortifications in the Rhineland to the defences of forts and fortresses built in Britain between the Claudian invasion of AD 43 and the death of Trajan in 117. His treatment of the continental material makes no claim to be comprehensive but forms an indispensable introduction to his study of the British evidence. Here the fluid military situation during the first three-quarters of a century of Roman rule means that forts were often built only to be abandoned after a relatively short period of occupation, while the vast amount of archaeological work carried out in this country has meant the location of many of the fort sites and test excavation at not a few of them. Though Jones laments the fact that the narrow sections often cut through the fort defences by their excavators may fail to find evidence for timber revetting if this existed, he is fairly confident that *most* earth ramparts in Britain were retained between 'cheeks' of turf or clay rather than by timberwork as was common practice in the Rhineland prior to AD 43. It is a pity that his study of the continental material does not continue later than this date since one is left in doubt, from the evidence as presented, whether this difference is regional or chronological. As far as Britain is concerned such few examples of timber revetting as are attested are all dated to the 70s or earlier, and though timber strapping for foundations may continue somewhat later, it ceases by the beginning of the 2nd century. Ramparts constructed entirely of beaten clay were introduced in the Flavian period, while stone defences, with the notable exception of Flavian Inchtuthil, only appear at the end of this period.

Jones' terms of reference include some discussion of the overall sizes of the forts enclosed by these defenced circuits: thus to judge from their relatively small areas, the forts planted by Agricola in the Pennines seem to have been mostly intended for quingenary infantry cohorts. Other topics covered are ditches, towers, the relative proportion of long axis to short axis in fort plans, and hints for would-be excavators of Roman fort defences.

The second part of the book consists of a useful catalogue of fort sites in Britain dated to the period under review. It serves to remind us that with the notable exception of the area covered by Nash-Williams's *Roman Frontier in Wales*, revised in 1969 by M. G. Jarrett, there is still no comprehensive survey of Roman forts in Britain. Jones' survey does not include plans, his descriptions are confined to the defences, and he is not concerned with developments later than Trajan, but in so far as it goes, it does go some way to filling this gap.

MARK HASSALL

SEDGLEY, Jeffrey P. *The Roman milestones of Britain: their petrography and probable origin.* Oxford, British Archaeological Reports 18, 1975. 56 pp., 5 maps. £1.00.

Roman Milestones is a slim volume – exclusive of the catalogue and maps there are barely a dozen pages of text, and it is with these that this review will be concerned. Sedgley first of all puts forward three premises derived partly from Mommsen's study of milestones in North Africa: (1) Roman roads in the provinces were built either by the state, in practice the army, or by the local authorities. (2) In the latter case milestones would normally be quarried in the territory of the local authority concerned whether *colonia, municipium* or tribal *civitas*, provided that quarries for suitable stone existed (in the territory of the *civitas* of the Atrebates there was in fact no suitable stone). (3) In the later empire the upkeep of all roads devolved upon the local authorities through whose territory they passed.

Basing his arguments on these premises and his own study of the origin of certain milestones and their actual findspot, Sedgley is able to show how, for example, both the territories of the *civitas* of the Belgae and the *colonia* at Lincoln were more extensive than previously thought. The rationale behind the study and the work of sampling the milestones and locating their petrological origins are above criticism, and it is no fault of the author that too few milestones have been found in Britain for him to have been able to produce dramatic results. Nevertheless *any* addition to our meagre knowledge of the political geography of Roman Britain is welcome and we should be grateful to Sedgley for carrying out his research and presenting the results so clearly.

MARK HASSALL

BARLOW, F., BIDDLE, M., VON FEILITZEN, O. and KEENE, D. J. *Winchester in the Early Middle Ages, an edition and discussion of the Winton Domesday*. Winchester Studies 1 (General Editor: Martin Biddle, Oxford, 1976). 612 pp., 33 figs., 11 pl. £32.

Winchester Studies 1 has been eagerly awaited by historian and archaeologist alike, particularly perhaps by medieval urban archaeologists whose very existence owes so much to the work of Martin Biddle and his colleagues in Winchester during the 1960s. Mr Biddle has also been one of the keenest protagonists of combined archaeological and historical studies, well aware that the medieval archaeologist should not rely on excavation alone. This publication is a brilliant example of the integration of many different types of evidence to form a picture of an urban settlement at a given period.

This volume, the first of a proposed series of 11, is devoted to an edition and discussion of the Winton Domesday which comprises two surveys of Winchester made in *c.* 1110 and *c.* 1148. Much of the information in the earlier survey (Survey I) seems to be based on official records prepared for, but never incorporated in, Domesday Book of 1086, so it can be used as a source for pre-Conquest Winchester; Survey II relates to the middle of the 12th century. As primarily financial and tenurial documents, the surveys present only a limited picture of 11th- and 12th-century Winchester and comparative evidence has been assembled to round out the town's topography, society and organisation.

For the archaeologist, one of the most interesting aspects must be the way in which archaeological evidence is combined with that from the documents. It is skilfully used to illuminate certain areas which cannot be more than hinted at by the documentary sources, for example, the origin of the street plan of the Saxon and medieval town, the house types, the date of the foundation of some of the parish churches and commercial activity in the early middle ages.

The planned lay-out of streets in the Saxon *burh* is referred to briefly (p. 279) to show that Winchester's street plan was old by the time of Survey I, and in more detail in the section on 'General Survey and Conclusions' (pp. 452–3), but no new evidence is brought forward to support the theory of Saxon town planning advanced by Biddle and Hill in *The Antiquaries Journal*, LI, 1971, and we must await the publication of Winchester Studies 4 for a fuller account of the archaeological evidence. Some doubting voices have recently been raised on this subject and their doubts will not have been assuaged by the present volume.

Excavated evidence is applied most thoroughly when discussing the house types of medieval Winchester; some new or re-interpreted material is incorporated although the definitive report on the medieval houses will appear in Winchester Studies 5. The timber and stone buildings whose ground plans have been recovered by excavation, and the still extant building in St Thomas Street show size, methods of construction and building materials, putting flesh on the bones of the surveys. Attempts are made to identify the excavated buildings with specific entries in the surveys, but conclusions are tentative. One disappointment is that archaeology, which claims to investigate the remains of the undocumented common man of the middle ages, has produced more evidence for the 'dwellings of the middle and upper ranks of Winchester society' (p. 348) than for the dwellings of humbler citizens which 'have either not been present in the areas excavated or have left few archaeological traces'. Perhaps we shall hear more about the latter (for instance, a small building on one site in *Tannerestret* tentatively suggested as being an example of poor class housing) in Winchester Studies 5.

Excavation has shown itself invaluable in dating the origin of Winchester's parish churches. Of six excavated churches, four have been proved to be of Saxon foundation, one is of uncertain date and one no earlier than the late 11th century. A pre-Conquest foundation had not previously been suspected in any example. On the other hand, the evidence published in Winchester Studies I suggests that archaeology has contributed less to our knowledge of Winchester's trade and industries in the early middle ages than might have been expected. Personal name, byname and place name evidence from the surveys contributes much more, and shows a town with an impressive variety of crafts and trades already divided into localised trading areas by the early 11th century.

Although this work is devoted to Winchester in the early middle ages, it is much wider significance. No archaeologist interested in medieval towns in England or abroad can afford to disregard the methods used here. Not many towns, of course, can hope to possess anything approaching the wealth of documentation of Winchester, but most have some written sources. This could prove to be the prime importance of Winchester Studies 1 to the medieval archaeologist: it is exemplary in its publication of documentary evidence and in the integration of archaeological and other studies. Above all, it vindicates the position of archaeology in the history of the medieval town – for all its documentation, Winchester still needs the material remains from excavation to illustrate its medieval life.

This review has mainly been concerned with some of the archaeological implications of Winchester Studies 1, and therefore with the contributions of Martin Biddle and D. J. Keene. The other authors should be given equal prominence. In their sections on the Winton Domesday and its personal and bynames, Frank Barlow and Olof von Feilitzen have provided the basis for all subsequent general or archaeological comment, not only in this volume but in the other volumes of Winchester Studies which will now be awaited with whetted appetite. HELEN CLARKE

BARRIÈRE, Cl. *L'Art pariétal de la grotte de Gargas* (*Palaeolithic Art in the Grotte de Gargas*), Parts i and ii. (Mémoires de L'Institut d'Art Prehistorique de Toulouse No. III, BAR Supplementary Series 14). Oxford, British Archaeological Reports, 1976. 408 pp., 144 figs., 93 pls. £8.50.

This monograph in two parts is now the standard work on the famous decorated cave of Gargas (Hautes Pyrénées, France). It makes many useful additions to and revisions of Breuil's earlier inventories of the palaeolithic art in this cave.

Barrière describes in detail a total of 231 negative prints of hands, most of them apparently mutilated, which were stencilled on the cave walls. He discusses possible reasons for so many of the hands being shown without various of their phalanges, and comes to the conclusion, following Sahly, that they were in fact mutilated, not manipulated in some way (e.g. fingers deliberately bent) for the sake of the paintings; and that because some of the configurations of missing joints on the hands are often repeated through the cave, '... the number of disabled individuals is far lower than it seems; ... a certain number of individuals whose hands were mutilated, deformed or rendered abnormal by accident, illness brought about by prevailing conditions, or hereditary disorder ... this group was in the habit of spraying paint, red or black for the most part, on mutilated hands placed on the walls of the cave in which they lived' (p. 83).

These people did not wish merely to paint their hands but intended to leave negative prints of them in the cave, '... either because this was the object of the exercise, or because it was intended to be the tangible, permanent "souvenir" of the painting of the hand, or because it was the image of a hand committed to the cave, which would explain the existence of groups holding a favoured position' (p. 84).

Hand images in cave art are notoriously difficult to represent accurately in photographs, especially, when as in this publication, colour photography is not used. The solution successfully adopted here is to have black and white photographs with tracing-paper overlays indicating the features under special consideration.

In addition to the famous hands, Barrière verbally and pictorially describes each of the 150 or so animal images – including half a dozen paintings and more than 140 engravings – found at Gargas. He finds three main phases of stylistic evolution in the depictions, which he further divides into a dozen stages. These stages are broadly based on superimpositions of images, one on another, and on stylistic differences, but Barrière does not necessarily claim any great chronological gaps between the stages; rather, there is a general stylistic trend from the crude to the sophisticated, from the rudimentary to the naturalistic.

He also attempts to relate the animal species depicted on the walls to some engraved plaquettes found in a Perigordian layer in the cave, to faunal remains found in Aurignacion and Perigordian layers there, and to environmental conditions of the time, but with not enough detailed data to make the discussion very enlightening.

This production is endowed with many useful photographs, drawings and plans, often on pull-out pages. The text is in two languages, French and English in parallel. While printer's errors and mistranslations are probably inevitable in a work of this kind, there are rather too many of both and if the reader should sometimes find himself confused by the English, he would do well to consult the original French.

ALEX HOOPER

DUVAL, P.-M. and HAWKES, C. (*eds.*). *Celtic art in ancient Europe*. London, Seminar Press, 1976. 316 pp., illus. £12.80.

Professors Duval and Hawkes have succeeded in producing a lavish book at what is today not an over-extravagant price. The 316 pages are packed with information, including three very full indexes, and 13 contributions, half in English and the rest in French. Some originally given at the colloquy in English have been translated into French, to present a more balanced volume. The dual-language approach is an excellent idea, as the book will now have a wider appeal. The quality of presentation is extremely high. The references are in the form of notes at the end of each paper; it would have been more convenient to have a complete bibliography at the end of the book. As it is, the book breaks down into sections, each consisting of a paper, the notes, the résumé and discussions, thus reducing the cohesiveness of the volume. As with all edited works it tends to be a collection of essays rather a distinct entity. Hawkes has tried to recreate the atmosphere of the colloquy by printing discussions at the end of each paper; in most cases there are incongruous and add little to what has already been said, and in others, new points have inadequate references, reducing their value.

Nevertheless, the wide range of subjects covered makes this a good review of the present position of Celtic art. The traditional approaches, such as sequence and dating of objects, and the origins of different styles, are well represented, e.g. by Klindt-Jensen and Frey. The perennial problem with Celtic art objects is, of course, that few are externally dated and hitherto most dates have been based entirely on design. In some papers, such as Dr Savory's discussion of Welsh La Tène shields, the traditional dating methods are taken too far, with the result that securely stratified objects are ignored or discredited. A newer approach is represented by Professor Jope's paper on the Wandsworth shield which is considerably enhanced by the discussion of manufacturing methods, an approach which could have been emphasised in more detail in the rest of the book – perhaps in a separate paper.

One of the most interesting new fields of Celtic art, the study of coin design, is well covered in two papers by Professor Duval and the late Mr Allen. Unlike other art objects, coins exist in large numbers, and as many are stratified, a secure system of dating should one day become possible. Duval's comparatively simple but accurate technique of recording the coin designs, though laborious, means that a considerable corpus of data is available for future detailed work. Duval's results hitherto are impressive. Allen's paper brings out the problems of style and chronology. His study of the relative dating of Cunobelin's gold staters shows the importance of applying analytical techniques to art objects (here the sequence is based on die links).

In conclusion, this volume is a worthy successor to Jacobthal's *Early Celtic Art*, being a good review of traditional methods applied on new ground, and with most new aspects fo the field covered.

JENNIFER FOSTER

FINLEY, M. I. (*ed.*). *Atlas of classical archaeology*. London, Chatto and Windus, 1977. 256 pp., illus. £8.50.

By page 16, the cards are on the table: the atlas is intended for students, active and armchair travellers, specialised and non-specialised. The field is Vindolanda to Ai Khanum, the period 1000 BC to AD 500. Mycenae and Thebes, Lyons, Alexandria and Palermo are out; Xanten and Chedworth are in, a nod to frogs living far from the pond. The contributors were not obliged to conform to more than a general brief.

In the circumstances, then, it is easy game to quibble over omissions. Greece without Crete and Mycenae seems preposterous; they are more conspicuous by their absence. Yet even if one accepts the stated limitations, the choice of sites often seems arbitrary, not to say bizarre. Why devote a page to Lindos, for example, when the similar site of Kos-Asklepieion has filled the preceding page? All this at the expense of Rhodes, a textbook of urbanism come to life, and Kamiros, one of the visually more rewarding Greek sites, which does not even rate a mention. Museums are thin on the ground; here again Rhodes has suffered; it might have done much for the banal pottery chart at the rear of the book. And what did central Gaul and Egypt do to deserve oblivion?

Bibliographies are equally eccentric. Why advise the general reader to plough through *Griechenlandkunde* when the *Blue Guide* offers a perfectly adequate and more current description of sites in English? And why, in a book that professes a strong interest in modern archaeological scholarship, is there no work cited for Lambaesis later than Cagnat (1912)? Did Janon (1973) and Rakob (1974) labour in vain?

The atlas suffers too from poor editing and the perpetration of old myths. Among the latter, I was surprised to learn from no less an authority than Professor Finley that 'soon after the Roman conquest of Greece, the amphitheatre also made its appearance throughout the Greek world' (p. 11). The so-called 'Temple of Minerva Medica' is hailed on p. 110 as an avant-garde expression of mid-3rd century architecture, but brickstamps informed us 20 years ago that it is one of the less successful and wholly typical experiments in court architecture of the tetrarchic period (Stettler, 1957; cited by Ward-Perkins, 1970).

None but the poor appear to have inhabited the 'cramped and noisy tenements' of Ostia, such as the 'Casa di Diana' (p. 112). But the *insulae* provided living space for every class of citizen (Meiggs, 1973). To pass, with no little amusement, to printing errors, the accolade for the most imaginative must go to the 'Temple of the Sincretist' [*sic*] in Ulpia Traiana (p. 139). More annoying is the omission of the explanation of the key to the plan of the Roman villa at Chedworth (p. 30).

A more fundamental criticism arises from the historicism of this atlas. One might legitimately ask how the ancients exploited their natural resources; the answer depends on the whim of the expert writing on the area in question. No physical relief maps, vegetation zones, trade movements, population densities. A more appropriate title might be 'An historical atlas of classical archaeology', for only Alexander and the Roman Empire win pictorial space, apart from the unrevealing pottery chart and a pictorial demonstration of the niceties of Greek architecture that is singularly unhelpful in explaining,

inter alia, the curiously chosen Byzantine capital from Caesarea (p. 225), and gives no historical or geographical currency to its array of Greek clamps.

A formidable band of scholars has been put to work on this volume, and the reader of this review may well ask what went wrong. All is not lost, however: there are choice plums to be picked from this book, among which I particularly recommend Professor Finley's masterly survey of the dynamics of Sicilian history, well illustrated by the chosen sites. Professor Rivet's picture of life in ancient Provence is superbly evocative, enough to raise anyone from his armchair and off to the sites. Michael Crawford gives an admirably succinct introduction to the turbulent history of classical Asia Minor, that is unhappily not matched by the miserable selection of sites. It is indeed unfortunate that, given the array of scholastic talent at their disposal, the publishers have chosen a brief that contains a built-in destruction mechanism. Who, then, will find it useful? I would not care to tout it from Vindolanda to Ai Khanum, though I might pack it on a trip to Sicily, as relief from the minutiae of the *Guida TCI*. In the library, I prefer to use the admittedly expensive but solid *Princeton Encyclopaedia*. It is useful, though, to have so many site plans between two covers; for this, and for much of the general discussion, we must be grateful.

SUSAN WALKER

ALICU, Dorin and NEMES, Emil. *Roman lamps from Sarmizegetusa*, BAR Supplementary Series 18. Oxford, British Archaeological Reports, 1977. 119 pp., 61 figs., 65 plates. £4.50.

This is an extremely useful publication of 512 lamps or lamp fragments from the Roman colony of *Ulpia Traina Sarmizegetusa*, the Roman capital of Dacia, which flourished from *c.* AD 110 to AD 271. Very few publications in English of Roman finds from this part of the world exist, and now, thanks to the BAR Supplementary Series, a whole series of foreign reports on finds, excavations, etc, is appearing in English.

The book itself is divided into three main parts: Chapter I is on 'Stamps discovered at Sarmizegetusa' while Chapter II describes the various types of lamps known from Sarmizegetusa. The third part is the catalogue which is supplemented by series of good drawings and photos of the lamps. Unfortunately it is rather difficult to get back to the text from the plates because the catalogue numbers are not written on them. Instead there is a list at the very beginning of the book. Surely it would have been easier just to write the catalogue numbers under the plates and disperse with the introductory list. The book is prefaced by a useful little introduction to the excavation at Sarmizegetusa by the present Director of Excavations, Hadrian Daicoviciu. It is a pity, however, that the plans of the site and the various buildings that have so far been excavated are so scruffy; this does not bode well for the final excavation reports, nor does it suggest that the lamps published come from any closely stratified 'sealed' deposits. The map of Roman Dacia, plate LIX (after the *Tabula Imperii Romani*) is also too heavily reduced. However, despite this, it is an extremely useful volume and will assist in a small way the great corpus of Roman lamps in the British Museum now being compiled by D. M. Bailey, which will be the nearest thing to a definitive work on Roman lamps.

TIM TATTON-BROWN

GOODBURN, R. and BARTHOLOMEW, P. (*eds*). *Aspects of the Notitia Dignitatum*. BAR Supplementary Series 15. Oxford, British Archaeological Reports, 1976. 224 pp., xxvii plates. £4.20.

The volume collects together most of the papers given at a conference held in Oxford in December 1974. Publication of such a varied batch of contributions from such a miscellaneous clutch of contributors within two years is a magnificient achievement, and for this, as for the excellent standard of the text, the editors deserve great praise. It is a great pity that the text of Dr Kent's excellent lecture on the *Comes Sacrarum Largitionum* could not be extracted from him in time for publication, but the omniscience even of editors sometimes fails.

The papers printed can be judged in two ways – as individual published papers and as contributions to the general theme of the late Roman document which gave its name to the conference. As individual published papers there are no weak links; each contribution is from a scholar and is therefore worth its place in the volume. Some of the scholars, however, go beyond the compilation of facts to deal with ideas and interpretations and these are the papers that most interest me. Of course the scholar who goes furthest is Tom Stevens who brought the conference to a wilfully scintillating close with expansive ideas on the *Notitia* in England. The facts are there – and anyone who assumes the

contrary has been taken in by Tom's genial bumbling façade – but they are piled course on course to build a medieval extravaganza. Vintage Stevens – now never to be repeated.

The volume starts with a very different essay by John Mann, unrivalled in knowledge of the sources, and clarity of their exposition. This paper like almost all of Mann's output is brief, concentrated, readable and, almost surprisingly, given the information purveyed, completely comprehensible. 'What was the Notitia Dignitatum for? – this was his brief and the result is a finely engraved gem, with the occasional flash of wit, packed with relevant detail. Between such an alpha and an omega – in the biblical sense I hasten to assure Tom's shade – what is the rest of the alphabet like?

In a class by itself comes Alexander's examination of the illuminated manuscripts in which the *Notitia* burst into the Renaissance. The Oxford manuscript, now well known through Dr W. O. Hassall's complete filmstrip, is only one of four equally important medieval copies – two in Munich, the other in Paris – and all four are subjected to an excellent scrutiny which ranges from 5th century luxury manuscripts to 19th century water-colours. Wild fills in some useful information on gynaecea, and Roxan contributes a list of Pre-Severan auxilia named in the *Notitia*. The first is a summary of material to hand, the second, the result of time-consuming research especially for the occasion. Johnson and Hassall write respectively on aspects of Britain – Johnson on his forte, the Saxon Shore, and Hassall on the general problem of Britain in the *Notitia*. Apart from his general views on naval strategy this paper gives Johnson the chance to develop in detail the thesis of a cross-Channel command with bases both in Gaul and Britain which was later split so that only possible remnants of the idea can be glimpsed by the time the *Notitia* was compiled. Hassall follows Mann in a clear exposition of the *Notitia* – this time tied to the Diocese of Britain – and his flow chart of the lines of power makes a superb instant crib for the non-expert.

Rivet asks some questions of the *Notitia Galliarum*, a separate document bound up in the *Dignitatum* bundle, Price looks in detail at the *limes* of Lower Egypt, and Matthews, rather wilfully, uses the occasion to make one of his detailed forays into the history and prosopography of the late 4th century. Penultimately Tomlin reminds us of the full title of the document which might be translated as 'A list of rank, dignitaries and administration in the civil and military service'. He draws the two sides together with a fund of very useful references to show that public service in the later Empire was not firmly divided between soldier and civilian.

RICHARD REECE

NIKOLOV, Dimitur. *The Roman villa at Chatalka, Bulgaria* (transl. M. Holman). BAR Supplementary Series 17. Oxford, British Archaeological Reports, 1976. 169 pp., 118 figs. £3.60.

In 1963, survey in advance of the construction of a reservoir revealed a complex of Roman sites dispersed over an area of about 2 km^2. Admirably, complete excavation followed of a residential villa (Delimonyovo Kalé), two *villae rusticae* (Delimonyovo Niva and Lambata), a village, eight large richly furnished barrows, a cemetery of smaller ones, a bath-house, pottery-, brick- and lime-kilns, a pagan shrine and a church. Evidence for prehistoric and Hellenistic occupation and a medieval hill-top settlement is not included in this book. Nikolov's thesis is that the whole complex represents the estate of one wealthy Thracian family: the 1st-century villas were reconstructed after being pillaged by the Goths in the mid-3rd century and were destroyed in the Gothic rebellion of 377–8, whereupon the former slaves and tenants built villages over the ruins which in turn were destroyed by the Huns in the mid-5th century. His discussions of the general significance of the sites are of considerable interest.

They must depend, however, on valid interpretations and a well-established chronology. Here is a serious deficiency. Apart from observation of the broad structural phases, there is no sign that any stratigraphy was recorded. While recognising the difficulty in conducting such large-scale rescue excavation with unskilled labour and limited resources, one must have reservations about some of Nikolov's approaches to his evidence and the arguments he bases on his deductions.

Uninterrupted occupation from the 1st century AD or earlier is inferred from sequences of coins, none of which has recorded associations; serious gaps between Nero and the later 2nd century are dismissed as fortuitous. The other evidence for 1st-century dating is unsafely based on general constructional features. Can the villas really be linked with the barrows, which do seem to have 1st-century material'. (N.B. the cavalry parade helmet, said by Nikolov (p. 65) to be of a type found 'mostly in the 1st century BC', is not paralleled before the late 1st century AD.) Can Lambata be securely associated with the other villas? Its re-used drafted masonry, similar to that of Delimonyovo Kalé's first period, could well have come from elsewhere: the marble architraves burnt in the Lambata lime-kiln almost certainly did (and do not convincingly demonstrate that lime production in this single kiln was for commercial and not for estate purposes). No evidence is offered to support Nikolov's assertion that the central building there (rooms 1–6) served mainly for animals and storage and was

not the dwelling house, possibly of an independent establishment. Bones receive no attention, and pottery little. Julian the Apostate rears his head to account for the demolition and reconstruction of the church. The identification of archaeological phases with historical events, however plausible the resulting story, needs far more support than the excavated record permits here.

The other main deficiency is in the presentation. Many of the 105 photographs are fuzzy or uninformative. We would have been better served by more detailed plans of individual buildings. There is no plan (or proper description) of any of the villages which succeeded the villas. There are many discrepancies between the dimensions of rooms and features on the block plans of the villas and those given in the text. The overall plan (Fig. 12) lacks a scale and a stated contour interval. The scale on Fig. 89 is back to front. Figs. 11, 75, 80, 84 and 89 are numbered out of sequence. Fig. 99 is obviously not the Roshava Dragana mound (no. 1) but a blow-up of either mound 5 or 6 on Fig. 100. Many Latin words are mis-spelled (and should be *gynaeceum*, p. 13, *horreum* and *vilicus*, p. 33, *exedrae*, p. 42, *partes rusticae*, p. 55, *caementicium*, p. 56). All these faults could and should have been put right by more rigorous copy-editing; one also feels that many of the above criticisms of the logic of the interpretations should have been raised before the manuscript was accepted for publication.

It is unfortunate that these factors should detract from a praiseworthy attempt to extend our knowledge of Roman archaeology in the Balkans, sadly restricted by language difficulties, and from the record of an important site.

T. F. C. BLAGG

PEACOCK, D. P. S. (*ed.*). *Pottery and early commerce: characterisation and trade in Roman and later ceramics.* London, Academic Press, 1977. xvi + 340 pp., 6 plates. £12.80.

Peacock has presented us with a refreshing new compendium of pottery studies by a variety of specialists, in which the New Archaeology makes itself felt. Well over half of the volume concentrates on Roman pottery, but then also spans British and French ceramic production up to the present century, with a final paper by Arnold based on documentary evidence which stresses the economic aspects of the clay pipe industry.

The volume is introduced by an article by Renfrew which very much summarises the whys and wherefores of ceramic studies. People and cultures are rightly stressed, getting away from the short-sighted, turgid studies which tend to see the pot as the ultimate goal. This paper helps to indicate levels of awareness which archaeologists might cultivate by paying heed to what perhaps might be termed ethnoarchaeology. Pre-Roman Iron Age society must have been far more complex than material evidence would seem to suggest; developed and sophisticated economic trends amongst contemporary 'primitive' societies are often quite surprising.

A greater objectivity, brought about by petrological studies is, not surprisingly, one of the main themes of the book. Peacock contributes a short paper on methods of processing excavated material which all students of ceramics should read. A section on the identification of common inclusions by a straightforward question and answer method is handy and should be used by anybody not versed in the more sophisticated methods of fabric analysis.

The editor's other contribution, on Pompeian Red Ware, has finally separated out some seven fabrics. A recent paper by Pucci,[1] which attempts to identify Pompeian Red Ware with *la patella cumana* of Martial and *calenas obbas et cumanos calices* of Varro, which came from Cumae, can now be seen in the light of Peacock's common fabric 1 for which he intimates a Campanian origin. Hopefully, this study will get the distribution it deserves amongst mediterranean ceramicists.

Fulford has contributed an important paper on Britain's trade in the later Roman period argued predominantly from known imports such as Mayen and Argonne ware, and exports of Oxfordshire and other wares. Grouping of glass wares, even by neutron activation analysis (p. 37), however, seems doubtful due to the extensive use of cullet.

Williams has published much of his PhD thesis based on characterisation of Black-Burnished ware by heavy mineral analysis. The work conveniently brings together the evidence for the various production centres and examines the distribution of products.

Loughin's paper on Dales ware is also comprehensive, although attempts at distributional analyses of pottery based on pre-existing site classifications might obscure distributions independent of the latter. Attempts at gouping sites by common factors, perhaps via cluster analyses, might yield interesting results.

The medieval and later pottery industry of the Malvern Hill region is studied in depth by Vince.

The contribution by Hodges on imported French pottery and wine is one of the most exciting in this volume. It exploits types of medieval pottery which reached Britain between the 5th and 12th centuries, and provides an interesting contrast to Fulford's late Roman importation.

Hinton's main paper, which precedes that of Hodges, deals in fact with later medieval pottery, but is more theoretical concerning itself especially with the interpretation of pottery and its relevance to social and economic studies. The question of quantification is illustrated by the writer's work at Wareham, where methods of counting, weighing and examining rim percentages and pottery volume were contrasted. A summary paper on the state of knowledge on medieval floor-tiles is presented by the same writer.

We must thank Dr Peacock and his colleagues, most of whom are at Southampton University, for producing such a stimulating work which can only be beneficial to the study of social and economic history. It is remarkably free from printing errors although, once again, its high price will limit the number of private buyers.

PAUL ARTHUR

[1] Pucci, G., *Cumanae Testae* in *La Parola del Passato*, **CLXIV**, 1975: 368–71.

PERCIVAL, John. *The Roman villa.* Batsford Books, 1976, 30 pp., 59 maps and illustrations. £10.00.

In some ways similar to the wide approach of the companion volume on Roman roads, this book is a useful historical introduction, although by no means neglecting the archaeology. Its strong point is that the author looks at the villa as an institution common to the Western Empire as a whole; he also looks at the distribution of different types, their settlement and tenure pattern, and the continuity of occupation on villa sites through into the 6th and 7th centuries. Thus for the first time this social and economic phenomenon is seen in its proper spatial and temporal perspective.

After attempting to define the meaning of the word 'villa' (and the limitations implied), Percival reviews the ancient literary sources before launching into a fairly traditionalistic historical outline. In reference to this, the fairly surprising assertion appears, that '... British Iron Age houses were almost exclusively round or oval in shape': this is then used as a background against which the advance of Romanisation is measured in terms of the arrival of the square Roman villas!

The regional survey is useful in showing the distribution and variation in villa plans in parts of Western Europe, although the work is especially thorough in Gaul as well as Britain. It also highlights the great lack of knowledge in areas like the Spanish Peninsula.

The last two chapters proved the most interesting reading, where the author's depth of knowledge on Roman Gaul reasserts itself on much neglected aspects of villa studies. The penultimate chapter attempts to show the survival of villas in the 4th and 5th centuries by the study of *-acum* place names in parts of Northern Gaul, with special reference to sites that developed into villages. The result is quite illuminating and adds another dimension to the understanding of the normal distribution maps which are a little misleading in only showing the 'failed' villas, which have been excavated and undisturbed by later occupation.

In the final chapter Percival discusses the significance of the appearance of late Roman burials on the sites of Roman villas in Gaul (and Britain), which became religious centres, viz. St Martin de Ligugé, and which consequently developed into churches and monasteries. This provides continuity into the Merovingian period and beyond; at a time when more attention is being levelled at late Roman cemeteries for what they can reveal about the actual character of the Barbarian settlement in the Roman provinces, these villas should also play an important part.

The plates are of good quality, although one wonders at their necessary relevance; plans are plentiful and well reduced, although it would have been helpful to have drawn in and labelled rivers (e.g. Fig. 17) and the position of Chiragan villa in Fig. 39.

All in all, well worth reading although a little expensive at £10.00.

SIMON J. KEAY

VILLARONGA, Leandre. *The Aes coinage of Emporion.* Oxford, BAR Supplementary Series 23, 1977, 84 pp., 15 plates. £2.20.

The pre-Roman copper coinages of Spain pose a problem to the majority of British numismatists and archaeologists who come across them. They occur rarely, but persistently, and almost always in very worn condition. Detailed classifications of them are hard to find, with the result that when they are referred to they rarely merit more than a very general mention.

Now both British students, and the bronze coinage of perhaps the best known Spanish mint, Emporion, are well served by a detailed classification in the clear, accessible, and moderately priced format of BAR.

The book is divided up into very short sections, often no more than one or two pages long, and then a catalogue of about 2,000 specimens, which must form the majority of surviving examples. This makes both for easy reading, and for immediate comprehension. The most remarkable, and useful, example is the section (pp. 24–7) on 'Classification Criteria'. I do not want to agree, or disagree, strongly with these criteria, and I have no very strong feelings about the final results, except to say that they seem remarkably sensible, coherent, simple, and consistent with all the evidence presented. What I do want to emphasise is the honesty of the author when he lays bare, in only four printed sides, his whole basis for the classification of this series of coins. This is of the greatest possible help to all who will use the work because they can see at a glance why Villaronga has put issues 9 and 10 after those that he has labelled 5 to 8.

He deals clearly with the Iberian inscriptions, formerly, for me at least, a severe blockage in understanding; magistrates are carefully accounted for; and his new chronology, which brings the most Roman issues down to the time of Augustus, avoids the earlier problems and improbabilities. His metrology seems inherently probable, but anyone who disagrees has the well recorded weights in the catalogue so that he may disagree in detail. All in all a most acceptable offering.

RICHARD REECE

WALKER, D. R. *The metrology of the Roman silver coinage, part II (from Nerva to Commodus).* Oxford, BAR Supplementary Series 22, 1977. 120 pp. £2.30.

This is the second volume of what, it is devoutly hoped in this Institute at least, will be a complete metrological analysis of Roman silver coins from the earliest republic to the fall of the Western Empire. Details of the project and the information given have been briefly described in the review of Part I (*Bulletin*, **14**, 1977: 223) so that for this part it is permissible to enjoy the new flood of information by merely picking out one or two points for special mention.

At last we have some firm details on which to base a discussion of the long debated 'debasement' by Trajan around the year 107. It is one of the few occasions on which we have documentary evidence to help in our understanding of the constant imperial manipulation of the coinage, yet the picture that Walker reveals is far more complex than the one sentence in Dio would suggest. There is no overall drop in the silver content of every denarius after the year 107; in fact something seems to happen a few years earlier, and the real nature of the 'debasement' seems to be simply the minting of more sub-standard coins.

We are prepared for the shock of the great Severan debasement in 193–4, but this survey does not quite reach that period; it stops just on the eve with the last issues of Commodus. Nevertheless we now know in far more detail how great the fall will be when the next thrilling instalment is published.

One point for which all archaeologists and numismatists associated with North Africa will give thanks is Walker's re-attribution of the silver, and hence the associated copper coins, with the reverse showing the head of Zeus-Ammon, from Caesaraea in Cappadocia to Cyrene. For many years this former mistake has bedevilled coin reports for sites in Cyrenaica where these coins are common, and, before this book was published, Professor Ted Buttrey had decided to take the plunge and insist that such coins were native to North Africa rather than odd examples of imported legionary pay. Now this bold step has direct metrological support.

RICHARD REECE

BICHAR, Gh. *Archaeology and history of the Carpi.* Oxford, BAR Supplementary Series 16, two vols., 1977. 213 pp., 188 plates, including 5 maps. £8.90.

For the 2nd century AD, the Carpi are located in the region north of the Danube mouth, between the Carpathians and the Black Sea. The evidence of Ptolomy does not allow of greater precision than this (III, 5, 10). The Carpi first assume significance in the (Roman) literary sources during the incursions of barbarian peoples in the early 2nd century AD, in which they played a leading role. As late as the reign of Constantine, the assumption of the title 'Carpicus Maximus' attests that they were still considered a military threat. However, the literary evidence is vague and unreliable. Our knowledge can only be supplemented by the results of archaeology. This Bichar attempts to do by reviewing the evidence for the Poieneşti or Vîrtişoiu-Poieneşti culture of Moldavia, centred upon the river Siret and its tributaries, which, he argues, is that of the Carpi themselves.

In the first volume, Bichar discusses the evidence from settlements and cemeteries (Chapters 2 and 3 respectively), speculates on the occupation of the inhabitants of the settlements and their cult practices (Chapters 4 and 9), and offers three interesting and fully documented chapters on crafts, pottery and small-finds, (5, 6, 7). The Roman coins from the region, representing both isolated finds and hoards (the latter reaching a notable peak under Commodus), are discussed in Chapter 8 (see, in particular, Table 12). Chapter 10 attempts to provide a dating for the Poieneşti Culture – 2nd to the early 4th century – a conclusion more in accord with the dubious literary evidence for the floruit of the Carpi than with the evidence of the, as yet, limited, results of excavation. Chapters 11 to 14 contain the literary evidence for the Carpi, well discussed with notes on the recent results of epigraphic studies, with reflections on the relations between the Carpi and neighbouring peoples, largely speculative, apart from the more tangible evidence for contact with the Roman Empire. Volume Two contains copious illustrations of pottery and small-finds and excavations. Distribution maps, with a good site-index, help negotiate the reader through the mass of sites, located but largely unexcavated.

The argument of the book, that the Poieneşti culture belongs to the Carpi, fails to convince. The relegation of the historical material to Chapter 11 by way of conclusion instead of introduction, is irksome. We read, (Chapters 1–10), of the Carpi and their culture, which, as Bichar admits, represents a continuing tradition from the late Geto-Dacian La Tène culture with the introduction of elements, characteristic of the Sarmatians (and those demonstrating Roman influence), before we learn of the continuing controversy surrounding the location of the Carpi. The literary evidence fails to support their association with Romanian Moldavia or disapprove it. The archaeological evidence so far presented is equally ambiguous. The problem is compounded by the actual state of research and by the very nature of the task. Within Moldavia, 170 settlements and cemeteries of the Poieneşti culture have been located, the majority by 'trial pits'. The only settlement site to be thoroughly investigated is Piana-Dulceşti (Neamt District) and, of the cemeteries – and these predominate – only Poieneşti has so far been published. Moreover, Moldavia was, throughout the time of the Roman Empire, a melting-pot of races and tribes. Getic peoples, for example, were for ever migrating to and fro across the Danube during the early 1st century (Strabo VII.3, 17). Ovid mentions in the Tristia and Ex Ponto numerous tribes living close to the Danube mouth, including Bastarnae, Sarmatians and 'Scythians' who may well also have occupied territory in Moldavia. The cultural fusion of many of these groups, which is clearly true of the Poieneşti culture, renders any attempt to distinguish Carpi from any other Geto-Dacian people a delicate, if not impossible task.

However, as a regional study of a barbarian people living on the fringe of 'Roman control', beyond the frontiers of the empire, Bichar presents an interesting, well-illustrated and documented picture, of value in itself and for the evidence it produces for the connections which this people had with the Roman world (see comments on imported pottery, largely amphorae, and the coin evidence).

A. G. POULTER

STIPČEVIĆ, Aleksandar. *The Illyrians. History and culture.* Translated by Stojana Čulić Burton, New Jersey, 1977. Noyes Press, Park Ridge, 291 pp., illus. $24.00.

From the 7th century BC down to Roman times, and even beyond, Greek and Latin writers record Illyrians dwelling east of the Adriatic, in the land between north-west Greece and north-east Italy, and extending northwards to the rivers Save and Drave, eastwards to the Morava and southwards to the Drin and Vardar. Although their material remains are relatively abundant, if not always intelligible, the identity and associations of the Illyrian peoples remain elusive, equally mysterious to philologists and to archaeologists. This is especially true in regard to the clear signs of an Illyrian presence beyond this area, notably in Italy (Venetia, Picenum, and Iapygia) but also in Greece and

western Asia Minor. Wisely such peripheral matters are for the most part left on one side in *The Illyrians* by Aleksandar Stipčević, first published in an Italian version (*Gli Illiri*, Milan, 1966), recently reissued in an extensively revised Serbo-Croatian edition (Zagreb, 1974) and now available in an English translation by Stojana Čulić Burton. Seven chapters (1, Illyrian studies; 2, History; 3, Everyday life and customs; 4, Cultural regions and artifacts; 5, Economic and social structure; 6, Wars and armament; 7, Religion and the arts) review the literary, epigraphic, philological, and archaeological evidence under familiar headings, together with the numerous controversies which they have generated. As might have been anticipated from the author of a most useful bibliography on the Illyrians (*Bibliographia Illyrica*, Centar za Balkanološka ispitivanja, Sarajevo, 1967, with supplement 1974) there are more than 30 pages of valuable annotation (pp. 251–84) to assist the reader, particularly in appreciating how much has appeared on Illyrian archaeology in Albania during the last decade (p. 265, note 59), where the national identity of descent from the Illyrians is now confidently asserted (Preface, pp. 1–2). This apart it is fair to observe that the book is concerned for the most part with discoveries that have been made in Yugoslavia and the literature relating to them, and for the English reader it is all the more valuable for that. Even if the second chapter on the history of the Illyrians (pp. 14–76) reveals the author at times to be unfamiliar with the wider background of Greek and Roman history, this is much less irritating than the erratic translation of personal and place names to English forms (for example on p. 36, 'Hersicrates the Corinthian Bacchant' ought to read 'Chersicrates the Corinthian Bacchiad'; on pp. 63 and 71, 'Kvadi' ought to be 'Quadi'. Outright mistakes are less frequent, although on p. 38, 'Knossos' appears for 'Knidos'; p. 86 should refer to Elder not Younger Pliny, and on p. 27, in the last line of the second paragraph, 'century' is a slip for 'millennium', while in the caption to the illustration on p. 219, 'AD' should be corrected to 'BC').

Within the area occupied by the Illyrians several archaeological cultures have been identified (pp. 106–11). They include Trebenište (princely burials down to the 6th and 5th centuries BC in the far south), Glasinac (a huge number of tumulus burials on a Bosnian plateau east of Sarajevo from the Bronze Age and later) and the more recently discovered Mati valley in Albania (tumulus burials representing the material culture of the Illyrians in the early Iron Age). Further north the historically recorded peoples Liburni and Iapodes have been identified through their cemeteries (notably of the Liburni around Nin excavated by Š. Batović, and of the Iapodes at Kompolje by Ružica Drechsler-Bizić, in the Una valley by Z. Marić and others). The latter are perhaps best known for their stone cremation urns with an incised decoration at times suggestive of direct Greek influence in the 5th century BC (pp. 207–14) but which appears to have persisted late into the Roman period. Near the head of the Adriatic the culture of the Istrian *castellieri* has been familiar since the study of C. Marchesetti which appeared at the beginning of this century. These hill settlements with their simple defences in the limestone karst of Istria are reproduced along most of the Adriatic coast and hinterland south of the Dinaric watershed where they are named 'gradina'. A good example is at Danilo Gornje between Šibenik and Split, where the Roman town Rider grew in the valley below the hill, in the territory of the Delmatae. The smaller cultures in the valleys of the south-east Alps (notably that represented by the great cemetery of Sv. Lucija near Tolmin) belong to the borders of Celtic and Illyrian settlement where many of the material and ethnic associations are still disputed. East of the Alps the Dalj culture (near Mursa at the confluence of the Drave and Danube) developed from a cremation rite in the Bronze Age to an Iron Age phase which is held to show influence of Alpine cultures to the west and Glasinac to the south.

In such a brief and modest survey one is not entitled to look for a deep insight into complicated problems any more than a major reassessment of detailed evidence. Yet great progress is often made through a brief survey drawing attention to what has been established and what remains unimproved. Here one has in mind how much has been achieved by the three Sarajevo *Simpozijum* volumes edited by A. Benac (1964, 1967, 1969), where local specialists have sought to deploy their arguments in a fashion that satisfied the curiosity of outside observers. The most familiar questions posed by archaeologists of the Illyrians concern the extent to which material advances are locally generated rather than being treated as the results of diffusion from more advanced societies nearby (in this case the Celtic peoples settled to the north after the 4th century BC, and the Greeks and Macedonians to the south, but also the Etruscans in Italy and the Thracians to the east). In the case of the Illyrians it seems reasonable to correct the balance in favour of local achievement, particularly in the estimate of the Greek contribution towards Illyrian development. To this end the arguments of Yugoslav and Albanian scholars are faithfully retailed by Stipčević, although it must be observed that these are no more successful than those of classically orientated scholars in defining the Illyrian identity when compared to surrounding peoples. Recent progress in Albania has served to emphasise the need for excavation and field work in areas further to the north. It may be right to criticise the description of the hill settlement at Osanići (near Stolac), capital of the Illyrian Daorsi who produced one of the local pre-Roman coinages with Greek legends (on which see now Zdenka Dukat and Ivan Mirnik in Vol. 13 of this journal, pp. 175–210), by Z. Marić as a 'completely Hellenised town' (p. 110). Yet such exaggerations cannot be easily ignored while Osanići remains isolated as an example of a

thoroughly explored gradina in the karst, not far from the Neretva valley where Greek merchants came to an *emporion* (Ps-Scylax c. 24, cf. R. L. Beaumont, *JHS*, 56, 1936: 186) in triremes and merchantment.

Illyrian lands included the coastal plain of Albania, the Dalmatian karst, Bosnian valleys, the south-east Alps, and part of the middle Danube basin. What the author rightly terms 'a diversity of natural conditions' (p. 133) ought surely to have received more extensive consideration even in a survey of less than 300 pages. That this has not been possible is less a reflection upon the author than on the direction that archaeological research has, or rather has not, followed. This is especially unfortunate when one considers the pioneer work on botanical remains (at Ripač by Gunther Beck Managetta (1896) and at Donja Dolina by Karlo Maly (1904) both river pile-settlements) and animal bones (by Jan N. Woldřich at the same sites; see the references on p. 271, note 10).

Although it must be observed that any future addition ought to be extensively revised and will have to incorporate many corrections, it would be unjust to end on a note of criticism, since in the meantime the author and his publisher should be congratulated for providing a servicable introduction in English to the archaeology of the Illyrians.

J. J. WILKES

BIBBY, T. G. *Preliminary survey in East Arabia 1968.* (Reports of the Danish Archaeological Expedition to the Arabian Gulf, Volume 2) (Jutland Archaeological Society Publications, Volume XII). Copenhagen, 1973. 67 + vi pp., 66 illustrations. Danish Kr. 60.

The title of this short book describes its contents well. It records the results of a three-month expedition to the Eastern Province of Saudi Arabia undertaken as part of the work of the Danish Archaeological Expedition to the Arabian Gulf. It may come as a disappointment that the author has chosen to give us this apertif instead of the long awaited main course of the important Danish excavations in Bahrain and Kuwait; but, if the standard of this volume is repeated in the future reports of the Danish Archaeological Expedition, we are in for a splendid feast when they are published.

The expedition confined its work to four areas, Thaj, Tarut Island, Uqair, and Yabrin. In each area careful survey was supplemented by limited sondages. At Thaj, a site which has been known for over a century and which has been the find-spot of a number of inscriptions in the South Arabian script, the sondage against the city wall produced a fine collection of pottery which Bibby dates to 300 BC to AD 100 by parallels with the excavated pottery from Bahrain and Kuwait.

At Tarut they found quantities of the red ridged Barbar pottery which is also found in Bahrain and Kuwait and which Bibby and others have thought represents the pottery of the state of Bahrain in *c.* 2000 BC. If one can equate ceramic distributions with political divisions, this would mean that the state of Dilmun included part of the east coast of Saudi Arabia.

Uqair has frequently been identified with the ancient town of Gerrha, which according to classical authors was one of the richest cities in the Gulf and was a great emporium and entrepot in the trade between Babylonia, South Arabia and India. In the investigations in this area the ruined city near Uqair produced no definitely Hellenistic sherds, but a site some 26 km further north had substantial occupation of that period. So little of each site has been examined that it would be rash to think that the problem of the location of Gerrha had been definitely solved.

At Yabrin, an oasis some 300 km from the coast, evidence was found of three distinct burial practices, cist graves, chambered tumuli and stone or gravel cairns. The precise dates of these presumably pre-Islamic structures are unknown.

The final pages of the book consist of a brief summary of the search for Stone Age sites by Holger Kapel and a notice of the discovery of Al-Dosariya, the first of many sites of the 'Ubaid period to be discovered in Saudi Arabia. These sites of the late 5th and early 4th millennia have now been investigated in greater detail by Abdullah Masry, *Prehistory in Northeastern Arabia: the problem of interregional interaction* (Field Research Project, 1974) and J. Oates, 'Prehistory in Northeastern Arabia' (*Antiquity*, 50, 1976: 20–31). They are of particular interest as showing direct maritime contact between southern Iraq and the Eastern Province at this early period.

As a final definitive publication this report shows certain defects. The three stones in South Arabian script discovered by the expedition are presented only in photographs without copies, transcriptions or translations. Only the top six layers of the sondage at Thaj are considered in any detail while the finds from the lower 10 layers of this sondage and from all the other sondages have not been analysed. The pottery, although beautifully drawn, is not described in detail and the findspots of the published pots are not indicated. The hole mouth jar in Fig. 39 on p. 43 appears to be more similar to Barbar pottery (e.g. Bibby, *Looking for Dilmun* (Pelican, 1972) 17 on p. 49) than to the Hellenistic

parallel that Bibby suggests. Since, however, the ware is not described, one has to take Bibby's judgement on trust. On Fig. 45 on p. 49 sites are numbered but there is no reference to these in the text. This is especially a problem with the Stone Age survey, which is so brief as to be almost useless. Perhaps in due course this Stone Age survey will be published in the same detail as Holger Kapel's *Atlas of the Stone-Age Cultures of Qatar* (Reports of the Danish Archaeological Expedition to the Arabian Gulf, Volume 1, 1968).

This book is excellently produced and is a valuable preliminary report on the preliminary survey in East Arabia 1968. Since that time there has been a great increase in archaeological work in Saudi Arabia; further more extensive surveys have now been undertaken and, for example, instead of the single 'Ubaid period site noted in the Danish survey some 40 sites of the period have been located. Nevertheless, the fact that the Danish survey is published gives it a considerable importance and must be a source of satisfaction to all those interested in the archaeology of Arabia.

MICHAEL ROAF

DARBY, William J., GHALIOUNGUI, Paul and GRIVETTI, Louis. *Food: the gift of Osiris* (2 volumes). London, New York, San Francisco, Academic Press, 1977. 877 + XLII pp. £12.50 each volume.

These two well-presented and beautifully illustrated volumes provide a detailed study of the main foods of ancient Egypt from about 5000 BC to the early centuries AD. Separate chapters are devoted to each type of foodstuff – in Volume 1, there are chapters on beef, pork, miscellaneous mammals, fowls and eggs, fish, reptiles and shellfish, sweetening agents, and salt, while Volume 2 covers grains, bread, beer, wine, aquatic marsh plants, vegetables and legumes, fruit, fats and dairy products, and spices and herbs. The writers have drawn on evidence from actual food remains found in ancient Egypt, from tomb paintings and sculpture, and from Egyptian, Greek and Roman texts. Appendices include an alphabetical list of Greek and Roman authors and chronological tables, and there is a section with maps of the Mediterranean basin, Italy, Greece, the Levant, south-west Asia and Egypt. Each chapter is followed by its own footnotes, and there is an extensive bibliography and detailed index.

The chapters deal with the occurrence of the food items in Egypt, both in texts and in art, their use in rituals, in medicine and as a food stuff. Information is also included on such techniques as the preservation of meat and fish, baking bread and preparing beer.

The illustrations are an important feature of the book and there are more than 300 of them, varying from full page plates to half-and quarter-plate drawings. Many of the photographs were taken by the authors themselves and all the illustrations are of an excellent standard.

Food: the gift of Osiris is useful and interesting when dealing with the use of food in medicine and religion but a little disappointing when dealing with nutrition. I would have liked Chapter 2, which covers the nutritional state of the ancient Egyptians, to have been longer and for more emphasis to have been placed on the extent to which each food item was eaten, and by which sections of the public. The authors state that the accurate assessment of the nutritional position of a country is almost impossible when attempting to cover over 'thirty centuries, from the Neolithic to the plenitude of Egyptian splendour' but even a tentative reconstruction would have been helpful. The short section on daily allowances and diets details some evidence which could perhaps have been enlarged upon.

However, the book is an impressive gathering together of information from a variety of sources and is probably worth having for its illustrations alone!

ROSEMARY ELLISON

DUMOND, Don E. *The Eskimos and Aleuts.* London, Thames and Hudson, 1977. 180 pp., 119 illustrations. £6.50.

In this volume, in the *Ancient Peoples and Places Series*, Don Dumond has made a valuable contribution to the, as yet, meagre literature on the Eskimos and Aleuts. The author's principal aim is to correct the current imbalance of emphasis in the literature by presenting 'the prehistory of the Eskaleuts from the centre of gravity of both their population distribution and their prehistoric identity'. Although the Eskimos above the Arctic Circle are familiar to all, the more numerous Eskimo-speakers of the South Bering Sea and the North Pacific regions and their linguistic cousins, the Aleuts, are seldom given a position of note in the present literature.

Although archaeological discoveries form the backbone of this study Dumon has also utilised the disciplines of anthropology, ethnography, and linguistics. These are well represented in the first section on historic contacts which prefaces the chapters on the major archaeological traditions. This first chapter is greatly enhanced by the addition of early photographs and line drawings, and especially by quotes from the accounts and diaries of adventurers and explorers. The major prehistoric traditions are then traced chronologically from the spot discoveries (which are given as evidence for the time of Eskaleut arrival in the New World) through to the Paleo-Arctic tradition, Northern Archaic, Ocean Bay, Kodiak, and Aleutian, Arctic Small Tool, Dorset, Norton and finally the all-encompassing Thule tradition. The salient features of each stage are presented, including discussions of geographical area, material culture, settlement pattern, and radiocarbon dates. For each of the periods a one paragraph summary of the excavated sites is given and comparative materials from American and Asian sites are also presented. In a final chapter the questions of possible Asian sources of origin and influence are discussed to the extent that this is possible with the presently limited knowledge of this area.

The major criticism to be levelled at the book from the point of view of the professional reader must concern the lack of references in the text and the provision of only a selected bibliography (apparently the standard format for the series). This would naturally make it very difficult to pursue the many points and arguments mentioned in the book. The professional may therefore find this work of limited use except as a general summary of work for each tradition.

The book is to be commended for the quality of its illustrations and line drawings. These are numerous and of high standard and especially noteworthy are the floor plans and sections of dwelling areas. Wide margins permit most artifacts to be shown immediately adjacent to their descriptions and reference numbers for illustrations to be positioned in the margins, allowing the reader to immediately locate the relevant text. Maps of each tradition are to be found in the relevant chapters. In general, the book is well written and an excellent summary of the prehistory of the Eskimos and Aleuts.

SHEILA COULSON

FLANNERY, Kent V. (*ed.*) *The early Mesoamerican village.* Studies in Archaeology Series. New York, San Francisco, London, Academic Press, 1976. xii, 377 pp., illus. £8.50.

In a little more than a year, this book has become an archaeological classic. Flannery describes this work as 'a book about Formative villages and some of the ways they can be studied' (p. 2), but it is much more than just this. Besides offering an excellent and up-to-date synthesis of the development of village life in Mexico, the book contains useful discussions of sampling procedure, interpretation and other aspects of archaeological theory. For this reason, it is of interest not just to people working in Mesoamerica, but to anyone concerned with the why and how of archaeology, regardless of his or her area of study.

The editor, Kent V. Flannery, reveals himself to be a satirist of such talent that this reviewer cannot resist a comparison with Thomas Love Peacock. Three semi-fictional characters, the Great Synthesiser, The Real Mesoamerican Archaeologist, and the Skeptical Graduate Student appear in the introductions to the various sections, arguing and criticising the book and each other.

Flannery ably justifies the vast amount of attention which the Mesoamerican Formative has received, mainly from North American and Mexican archaeologists. The period between 1500 and 500 BC saw the beginning and development in Southern Mexico and Guatemala, of true permanent villages based on an agricultural complex unique to the New World. On this basis the fascinating high civilisations of Mexico developed. These include, of course, the Maya and Aztec.

Clearly organised, this book approaches regional analysis by devoting chapters to demographic units of increasing size. These units are discernible archaeologically and have the household as the basic unit. Next comes the community, which can sometimes be equated with the *barrios* of modern Latin American towns, the village, its catchment, and the region. Growth, stylistic variation and inter-regional exchange and religious networks are also examined.

The work is the result of close co-operation between a number of active Mesoamericanists and as such reflects a wider spectrum of thought than would be possible if it were the work of a single writer.

Considering the excellence and complexity of work which has gone into producing this book, it is a disappointment that it is sometimes substandard in its illustrations. Admittedly, these are often taken from other sources, but it is none the less annoying to find that a contour map of San Lorenzo, Veracruz, lacks a scale, or that maps of the Hatchery West site are set crookedly on the page. A partial plan of a structure at Coapexco, Valley of Mexico, is well nigh incomprehensible. As an archaeo-botanist, this reviewer finds Flannery's views on environmental recovery to be simplistic and mis-leading (pp. 104–5).

It would not be accurate to give the impression that this is only, or even principally, a work of theory. It contains valuable factual information on such topics as the form and construction of the early village house, the size of Formative villages, exchange, and many other subjects.

The contributors shy away neither from firm statistics nor from common-sense verbal logic, illustrating that there is no incompatibility between what is sometimes thought of as two conflicting modes of thought. They point out many common fallacies in archaeological reasoning, and for this alone *The Mesoamerican village* should be read by all archaeologists.

MONICA BARNES

BROMMELLE, N. and SMITH, P. (*eds*). *Conservation and restoration of pictorial art.* London, Boston, Butterworths, 1976. 270 pp., figs., black and white and colour illustrations. £18.00.

This book consists primarily of papers selected from the volume of preprints of contributions to the 1972 Lisbon Congress of the International Institute for Conservation published in that year entitled *Conservation of paintings and the graphic arts.* Written by international experts in these and related fields, it presented a series of specialist articles on topics ranging from particular methods of treatment and case histories to assessment of adhesives. Unfortunately, the title of the book under review here does not make this clear. On the contrary, one might be misled into believing that it is a basic manual on the subject. This shortcoming has been anticipated by the editors and is mentioned in their preface. Nevertheless, one feels that this fault could easily have been remedied by the use of an appropriate sub-title.

Several of the articles presented here will appeal to conservators involved in other specialisations. For example, Robert Feller's article on 'Problems in the Investigation of Picture Varnishes' discusses properties of synthetic resins applied to a far wider range of materials than paintings. However, it is regrettable that, with the exception of three articles, this volume duplicates papers virtually unrevised since 1972. New material related to the topics covered has been published subsequently, which has not been taken into account; for example, the development of techniques for the identification of binding media (see e.g. Mills, J. S. and White, R., 'The identification of paint media from the analysis of their sterol composition – a critical view', *Studies in Conservation*, **20** (4), and Masschelein-Kleiner, L., 'An improved method for the thin-layer chromatography of media in tempera paintings', *Studies in Conservation*, **19** (4). It therefore seems unnecessary to have produced a new book under a new title with a new publication date and yet with old material. It would perhaps have been preferable to have reprinted the original volume which included over a dozen articles now omitted and to have published the three new articles in some relevant journal.

Despite this reservation, it remains to be said that the volume in its present form is better produced, and includes an index which greatly enhances its value as a reference book and colour plates of excellent quality. Articles written in French in the 1972 version have now been translated into English. Above all, this book offers a wealth of information especially when read in conjunction with the more recently published material.

K. TUBB

GREENHILL, Basil with chapters by J. S. MORRISON and Sean McGRAIL. *The archaeology of the boat.* London, Adam & Charles Black Ltd, 1976. 320 pp., 213 figs. £7.50.

Basil Greenhill describes his book as a 'short, simple, popular, introductory handbook' and prefaces it disarmingly with the note that 'this may well be the last occasion on which a layman without professional qualifications as archaeologist, ethnographer or naval architect will be able to venture into the subject on this scale'. As Director of the National Maritime Museum, however, he has been well placed for an overall view of these specialisms, while his own earlier books mark him as no layman. Furthermore, with 320 pages and 19 wide-ranging chapters 'short, simple' seems an unlikely description. The 'popular, introductory' aims have however been well satisfied for the most part.

Thus, an internally consistent technical terminology has been sought. A glossary clarifies his innovations (sensibly, in this context, eschewing the engaging entanglements of alternative local usages). Points of morphology and construction are made explicit by over 200 illustrations (black and white photographs and drawings). While some of these are not unfamiliar, a measure of repetition of

key material seems inevitable in an avowedly introductory volume. General and chapter bibliographies, while necessarily less than exhaustive, are pleasantly international and certainly serve to indicate the rich variety of themes that the reader interested in boats might go on to explore for himself.

How far the book lives up to its title has however been disputed. Austin Farrar has gone so far as to state that 'this book ... has relatively little to do with nautical archaeology ...',[1] while on the other hand D. R. Goddard 'would certainly exonerate the author from the charge that this is not archaeology'.[2] This reviewer feels strongly that too narrow a definition of 'archaeology' is likely to be counter-productive in attempting to understand artifacts so functional and so subject to ethnographic and experimental insights as boats (e.g. Christensen and Morrison[3]), and he is accordingly pleased to leave the last word to Professor Grimes in his introduction to the book: 'It is a model of method. Its treatment of the subject argues inescapably for the total approach in which ancient and modern, primitive and advanced, all have their contribution to make.'

IAN A. MORRISON

[1] *Mariner's Mirror*, **62**, 1976: 403.
[2] *I. J. Nautical Archaeol.*, **6**, 1977: 360.
[3] Experimental archaeology and boats. *I. J. Nautical Archaeol.*, **5**, 1976: 275–84.

FORD, T. D. and CULLINGFORD, C. H. D. (*eds*). *The science of speleology.* London, Academic Press, 1976. 593 pp., illus. £14.00.

This book is one of the successors to the standard work, *British caving*, which was first published some 20 years ago and gave rise to a much expanded edition and several monographs. The chapters of the present volume are by specialist authors and cover the following subjects: cave surveying and detection, the geology and geomorphology of caves of limestone and volcanic origin, the hydrology and erosion of limestone terrains, the chemistry of cave waters, cave mineralogy and meteorology, cave flora and fauna, cave palaeontology and archaeology, and the role of computers in speleology.

For the general reader, as well as offering useful introductions to the technical aspects of the various subjects, the individual chapters often intrigue him with surprising facts and ideas. For example, in winter it may often be colder just inside a cave than just outside it and in summer it may be warmer just inside a cave than just outside; or, before the coming of the computer it was just about impossible to do all the calculations necessary for even a simple analysis of limestone solutions; or, it is feasible that the cave crustacean *Proasellus cavaticus* might be part of a food nexus that is independent of solar energy; or, that it is not only an offence to ring any species of bat in Britain without a licence from the Nature Conservancy Council but also you would need a licence even to handle the Greater Horseshow and Mouse-eared bats; and so on.

Of direct interest to the archaeologist are the short surveys of palaeontological and archaeological cave sites in the British Isles by A. J. Sutcliffe and A. King respectively; and the effort by M. Walker, in the cave art section, to relate the content of paintings in caves and rock shelters in south-east Spain to the way of life of people in the neothermal period of *c.* 6000–1500 BC.

Not the least among the virtues of this compendium are the extensive reference lists at the end of each chapter, and the various glossaries, check-lists and definitions of technical terms.

ALEX HOOPER

GREEN, Jeremy N. *Australia's oldest wreck: the loss of the 'Trial', 1622.* BAR, Supplementary Series, 27. Oxford, British Archaeological Reports, 1977. 60 pp., 15 figs. £1.50.

Among the provisions made by various governments around the world for the conservation of archaeological sites underwater, those of the state of Western Australia are among the most commendable. Not only is there comprehensive legal protection, but a fully staffed and equipped maritime archaeology unit has also been created to undertake fieldwork. Since 1971 this has been under the direction of Mr Jeremy Green, and has concentrated on the excavation of a number of Dutch wrecks off those shores. However, one of Mr Green's first tasks on arrival was to inspect a wreck site in the inhospitable Monte Bello Islands, off Australia's north-western coast, thought to be that of the oldest known wreck in those waters, the English East Indiaman *Trial* of 1622. Unfortunately, no positive identification of the site was forthcoming, so that this report concludes 'the identification is only tentative that the wreck site is that of the *Trial*'.

As a consequence of this lack of archaeological evidence, 43 of this report's 56 pages are concerned with a fully illustrated review of the documentary material relating to the loss of the *Trial*, the general 17th century background, and the relocation of the site in modern times. In view of the importance of this wreck in Australian history, this résumé is valuable, and should remain an essential reference source for many years.

On the contrary, the presentation of the archaeological material, which occupies the last dozen pages, is disappointing. Since no historical source reveals the size or gun establishment of the *Trial*, the observed scatter of cannons and anchors cannot yield a positive identification, although the tally of anchors does in fact suggest a larger vessel than the *Trial* is thought to have been. The single most important piece of evidence in favour of the identification is the position of the wreck, which makes it particularly regrettable that there is no site location map. A detailed plan is presented of part of the wreck site, although this is derived from a photomosaic and has a stated accuracy of '± 10% approximately'. Although considerable allowance must be made for the rough conditions encountered here, this publication is not representative of the high standards possible on underwater sites, and which the Western Australian unit itself has achieved elsewhere. It is to be hoped that a return can be made to this area some day, during a period of calmer conditions, and further attempts be made to identify positively the wreck of the *Trial*.

KEITH MUCKELROY

LAKE, F. and WRIGHT, H. *A bibliography of archery*. Manchester, The Simon Archery Foundation, 1974. 501 pp., £10.

The development of archery, probably in the Upper Palaeolithic, marked an important advance in man's hunting technology, and archaeologists interested in toxophily will find much of interest in this bibliography. Basically a catalogue of references to all aspects of archery, it contains some 5,000 entries of which most are journal articles (3,666), though books published since 1545 as well as theses, manuscripts and films are also included. Most of the book, some 300 pages, is a general list of references arranged by author, and useful special features are a subject index at the back and a list of locations of most of the books and journals in Britain and North American libraries.

A bibliography as exhaustive as this points up the depressing tendency, alas not confined to those who write on archery, to make the same discovery again and again. Nevertheless, a discriminating reader will find original and authoritative contributions on subjects ranging from primitive archery in general, to chipping arrowheads, arrow velocity, bow design and hunting techniques. Very few papers on prehistoric archery have been overlooked, but perhaps articles by Ahler, Browne, Tizzer and Witthoft on flint and bone arrowhead design, use and breakage, could find a place in later editions of the bibliography, if necessary at the expense of references to stray finds of arrowheads. A very minor criticism concerns the compilers' use of the term 'fluted arrowhead' for North American fluted points, which are viewed by most archaeologists as tips for darts or spears and not arrows.

In the short time since its publication, the Lake and Wright bibliography has become accepted as an essential research tool and major contribution to the study of archery, and the compilers are to be congratulated on a careful piece of scholarly work.

MARK NEWCOMER

McGRAIL, Sean (*ed.*). *Sources and techniques in boat archaeology*. London, BAR Supplementary Series, 29, 1977. 315 pp., many figs. £6.00.

For those who have wondered what it is that boat archaeologists do, this collection of papers, the proceedings of a symposium held at the National Maritime Museum last year, should provide the answer. Different aspects of boat archaeology are dealt with under separate headings: Glossary of terms, Wood degradation and conservation, Ethnography and living tradition, Quantitative techniques, Recording finds, Hypothetical reconstruction of boat finds, Experimental archaeology, Ancient boatbuilding; practically every aspect of the subject is covered with the single, unfortunate omission of techniques used in studying and recording boat structures underwater.

Though by no means intended as an introduction to boat archaeology, this volume contains many articles of interest to the land archaeologist; indeed, this volume will confirm that, in his

approach to the subject, the boat archaeologist is merely a land archaeologist with a nautical gleam in his eye. The section on recording finds, for example, containing papers by Ole Crumlin-Pedersen, Angela Evans and Carl-Olaf Cederlund, shows that standards for recording boats are as high as those for recording any archaeological object. Those interested in the use of quantitative analysis should read Sean McGrail's report on the work being done on dugouts by the National Maritime Museum and J. W. Graham's stimulating paper on the wider applications of this technique to the study of boat structures. Other notable papers, which give a brief indication of the wide range, both geographically and chronologically, of the symposium, include Professor Filgueiras' exhaustive 'diffusionist' study of the Xavega, a type of Portuguese fishing boat, and Arne-Emil Christensen's deliberately provocative review of recent typologies based on boat morphology.

In attempting to cover the whole of boat archaeology in one symposium, rather than limiting the scope of the papers to one particular aspect, the National Maritime Museum ran the risk of producing mere generalisations. Though this pitfall has been successfully avoided, the published proceedings are, from a boat archaeologist's point of view, unsatisfying in that they fail to quench the thirst caused by the symposium. It is clear, from the vigorous discussion after each paper, that each section could comfortably be expanded to form a weekend conference. Perhaps the National Maritime Museum will follow this symposium with others based on more specific topics? The recent symposium on dendrochronology, held in Greenwich, was an excellent example of this, and, hopefully, will be the first of a series of more detailed discussions on boat archaeology.

JANE WEEKS

CASTEEL, Richard W. *Fish remains in archaeology and paleo-environmental studies.* New York, San Francisco, Academic Press, London, 1976. x + 180 pp. £6.80.

Casteel states, on p. 1 of this book, that 'this work is presented as an introduction to some of the literature on fish remains ... ', and he does what he claims to do. However, the word 'some' is important because the bibliography is heavily biased in favour of the USA, USSR and Japan. According to Casteel the reason for this long list is to provide readers with information not easily known to them, but many, probably most, of the references are not easily available to readers in Britain, and some of the references, as with Hargrave (p. 6) are simply to show that little or nothing has been done with the biological material. Of the 180 pages in this book, 24 are given up to bibliography, and over 60 entries of this are in the Cyrillic script.

The book consists of seven chapters. The first is an introduction to the subject, showing archaeology's early dependence on geology and palaeontology, referring to early literature and the omission in later (North American) literature. Casteel shows that, despite belief to the contrary, attempts to identify fish remains from archaeological sites are not new; as early as 1882 a detailed study was published of the Lake Ladoga area fish remains, and in 1911 the Japanese were practising water separation techniques in order to extract the micro-material.

Chapter 2 points out the need for a comparative collection of fish remains and gives a list of references for osteologies of various groups, though on checking the majority of these refer to Western American and Russian species. This chapter also describes various methods of defleshing the modern material.

Chapter 3 is concerned with otoliths; their various types of composition, their use within the fish, terminology, description and uses as a means of estimating live weight and seasonal dating. Perhaps Casteel puts too much importance on the accuracy of fish size determined from archaeological otoliths; these are frequently rolled and, especially with the more ovoid shapes, are likely to lose a considerable part of their length – from which the measurement is taken and the calculation made. This chapter presents a very good example of the irritation of lines of references, at least 12 lines on p. 24, most of which refer to palaeontology or modern ichthyology.

Chapter 4 deals with scales, including scutes; their method of seasonal formation is described and their (limited) use in estimation of live weight. Though Casteel does recognise the problem in archaeology that one is not able to choose scales from the most informative part of the body, one is left with the feeling that, as with some other aspects of archaeological data, the less weight put upon the information retrieved the better. For instance, on pp. 62–4 Casteel attempts a system of estimating the minimum number of individuals from scales: this is so fraught with probabilities of error that the time used in the exercise could easily be put to better use. However, to do Casteel justice, he does have a section headed 'Limitations on the use of fish scales and some possible sources of error' (p. 69).

Chapter 5 is concerned with vertebrae, probably the commonest fish remains in the archaeological record. As with scales, vertebrae (centra) can be used for seasonal dating, ageing, calculation of

minimum numbers and estimation of body weight. Although one can divide the vertebrae of a complete modern specimen into many sections, when these subdivisions are projected onto the archaeological material the degree of possible error is so great as to render any information extracted from them of little account and therefore Casteel's subdivision of vertebrae (pp. 77–8) is perhaps too detailed: the 'proatlas' is simply the caudal aspect of the basioccipital; the first, second, third and fourth vertebrae are unique, as is the ultimate one and these can be used individually; apart from this there are only two clear-cut groups – abdominal (or thoracic) and caudal, respectively those without fused haemal spines and those with.

Although various methods of estimating size of fish have already been mentioned, in Chapter 6 Casteel concentrates on this subject, under five subsections: the single regression method, the double regression method, the proportional method, White's method and the Cook and Treganza method. He describes each in detail, concluding that the first and second methods are the most accurate.

Chapter 7 deals with 'the application of information, derived from the study of fish remains, to problems of zoogeography, climatic and environmental change, and fisheries.' (p. 124) and refers to sites in the Crimea, the Lower and Middle Irtysh in Siberia, Asiatic USSR and California. The sites of Bakhschissarai, Murzak-Koba and Siuren' are fascinating and show how one can reconstruct the past environment and the state of rivers (or 'hydrological regime') with the aid of piscatorial evidence because fish, particularly freshwater species, are very particular about their environment; if a species is present in any number in a particular area, then the conditions it demands must also have been present in that vicinity at that time (these are 'Azilian-Tardenoisian' – early Holocene – sites and trade is not taken into consideration).

It must be admitted that the initial disappointment in this book was due to a misunderstanding arising perhaps from the title. One hoped the book would be a guide to the identification of fish remains from archaeological sites, and this it most decidedly is not, as the author admits: 'It does not attempt to present a complete guide for the identification of fish remains . . . ' (p. 1). Taking a parochial view, this book is not very helpful from the identification viewpoint, which is what most readers in this country would probably want it for. The standard of the photographic illustrations is poor and why, in these days of high printing costs, must the Cyrillic script be used, not only extensively in the bibliography but also in lengthy extracts within the text? This is surely an affectation since each extract is followed by a translation.

Books concerned with fish remains from the archaeological viewpoint are so few and far between that one is thankful for anything, thankful but nevertheless disappointed.

P. A. RHODES

FRITTS, H. C. *Tree rings and climate*, Academic Press, 1976. 567 pp., figs. £16.

Dendrochronology embraces a much wider field of study than the dating methods most familiar to the archaeologist. The term *dendroclimatology* refers to the application of tree-ring studies to the investigation of past and present climates, and this book by Harold Fritts of the Laboratory of Tree-Ring Research, University of Arizona, Tucson, is the first to be devoted to this rapidly developing scientific discipline.

The precise dating of the growth rings in trees from temperate climatic regions is possible because the growth of such trees is frequently affected by variations in the climate and this results in sequences of wide and narrow growth rings in the wood that can be matched in many trees growing over a wide area. Discussions of dating methods currently used in archaeological investigations may be found in several textbooks and review articles but these rarely include a discussion of the climate – growth relationships or the statistical properties of tree-ring data. Whilst it is not essential to know much about the climatic control of tree growth in order to use favourable tree-ring data for dating events, the reviewer is convinced that some background knowledge of this kind will help the use (and researcher) to appreciate the limitations of the methods and materials and make sure that they are employed to the best advantage. This book is therefore recommended to all who may use tree-rings, for whatever purpose.

The book opens with a brief historical review of tree-ring studies and the aims of the 'founding father' Andrew Douglass. The following four chapters are devoted to a concise discussion on the physiology of tree growth. This section will be particularly valuable to botanists and forest ecologists and others interested in the manner of tree establishment and survival. A chapter dealing especially with the climate – growth system and the construction of models for the inferred relationships between ring-width and climate provides a bridge between the physiological section and the second half of the book which is more 'statistical'. Here the statistical techniques and data manipulation which are essentially the 'dendroclimatic method' are described. The author shows how the valuable

information to be derived from tree-rings can be applied to a wide range of problems in hydrology, meteorology and ecology, and there seems little doubt that dendroclimatology has much to contribute to our knowledge and understanding of the world's climate, both past and present. To a great extent these chapters are a collation of several research articles previously published by the author and his associates at the Laboratory of Tree-Ring Research. The approach to the subject is thus a very personal one and, as the author states in his Preface, it should be regarded as a progress report on a rapidly developing subject. The result of this is that there is little or no discussion of the older work by European forest botanists (although references to it can be found readily enough through the bibliography). Readers already familiar with the literature will probably agree that this treatment of the subject is not unreasonable in view of the recent advances made by Dr Fritts and his colleagues. But some may feel this to be a deficiency and would have liked some appraisal of the results of these earlier studies.

The book is well printed with apparently few typographical errors: two worth mentioning are the word 'predicator' for predictor on p. 341, and the reference to 'Equation 7.2' on p. 359 which should refer to Equation 7.5. Such small errors and the omission of capital letters from the substantives in the titles of German articles in the bibliography will be rectified in a new printing.

DONALD BRETT

BOOKS RECEIVED

The following books have been received. The fact that they are listed here does not preclude their review in a later issue.

ADAMS, R. E. W. *The origins of Maya civilization* (School of American Research Advanced Seminar Series). Albuquerque, University of New Mexico Press, 1977. xvi + 465 pp., illus. $20.00.

BARKER. P. *Techniques of archaeological excavation.* London, Batsford, 1977. 279 pp., 86 figs. £8.95 hardback; £5.75 paperback.

BINTLIFF, J. L. *Natural environment and human settlement in prehistoric Greece, based on original fieldwork.* Parts i and ii (BAR Supplementary Series, 28). Oxford, British Archaeological Reports, 1977. 734 pp., illus. £13.50.

BREA, L. B. *Poliochni: città preistorica nell'isola di Lemnos.* Vol. II, 1–2, text and plates (Monografie della Scuela Archeologica di Atene e delle Missioni Italiane in Oriente II). Rome, 'L'Erma' di Bretschneider, 1976. xv + 345 pp., 28 pp. tables with pls. 191–284. L155.00.

BRUNELLO, F. *The art of dyeing in the history of mankind.* Vicenza, Neri Pozza Editore, 1973. 467 pp., 178 pls., 7 col. ps. Price not stated.

CAMPS-FABRER, H. (*ed.*) *Premier colloque international sur l'industrie de l'os dans la préhistoire.* Aix-en-Provence, Université de Provence, 1974. 232 pp., illus. Fr.75.

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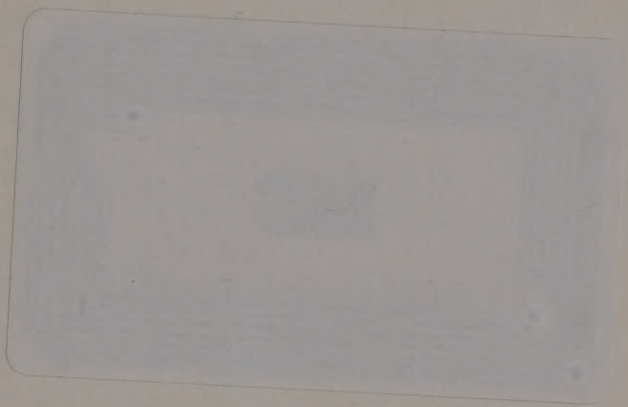

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